DEVELOP AND IMPLEMENT AN
INTEGRATED ENTERPRISE INFORMATION SYSTEM
FOR
A COMPUTER-INTEGRATED APPAREL ENTERPRISE
(CIAE)

Final Technical Report

Reported by:

Dr. Sundaresan Jayaraman
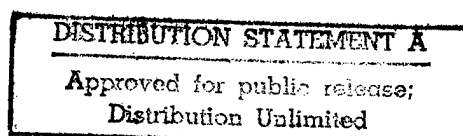Principal Investigator

Georgia Tech Project #: E-27-699

Georgia Institute of Technology
School of Textile & Fiber Engineering
Atlanta, Georgia 30332-0295

Tel: 404/894-2490
Fax: 404/894-8780
E-mail: sundaresan.jayaraman@tfe.gatech.edu

January 1998

SJ-TR-CIAE-9801

19980623 117

REPORT DOCUMENTATION PAGE

Public reporting burdens for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 2202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503

1. AGENCY USE ONLY *(Leave Blank)*	2. REPORT DATE January 24, 1998	3. REPORT TYPE AND DATES COVERED Final Project Report: September 14, 1996 – November 4, 1997

4. TITLE AND SUBTITLE
Develop and Implement an Integrated Enterprise Information System for a CIAE

5. FUNDING NUMBERS

C

6. AUTHORS(S)

Sundaresan Jayaraman; Annajee Rao Nott;
Rangaswamy Rajamanickam; Lynn Langston

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Georgia Institute of Technology
School of Textile & Fiber Engineering
Atlanta, Georgia 30332-0295

Through: The Georgia Tech Research Corporation

8. PERFORMING ORGANIZATION REPORT NUMBER
SJ-TR-CIAE-9801

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
US Defense Logistics Agency, DLA-MMPRT
8725 John J. Kingman Road, Suite 2533
Ft. Belvoir, Virginia 22060-6221

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES   COR:

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

Research has been carried out to design, develop and implement an Information System for defense apparel manufacturers using the *building blocks* from the Apparel Manufacturing Architecture (AMA), a generic architecture for an apparel enterprise. ARN-AIMS consists of three modules – Order Processing, Order Tracking and Shipping & Invoicing. The Order Processing Module is designed to facilitate the entry of customer orders for stock and special measurements for both military and commercial products. The Order Tracking Module helps the defense apparel manufacturer (DAM) track the status of an order in any part of the enterprise – from order entry through invoicing -- and identify bottlenecks in the system. It helps the DAM respond easily to inquiries from the customer (e.g., the Defense Personnel Support Center, DPSC). The Shipping & Invoicing Module generates an invoice (e.g., DD250) based on the order information entered in the system. ARN-AIMS runs on IBM-compatible machines in Microsoft Access for Windows 95. ARN-AIMS has been successfully implemented at three DAM sites. The ensuing benefits to the DAMs have been quantified. The advantages of the architectural approach to information systems development over an ad hoc approach have been assessed quantitatively.

14. SUBJECT TERMS Defense Apparel Manufacturing; Enterprise Architecture; Information Architecture; Modeling; Information Systems; Integrated Databases;	15. NUMBER OF PAGES 72
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT Unclassified

DEVELOP AND IMPLEMENT AN
INTEGRATED ENTERPRISE INFORMATION SYSTEM
FOR
A COMPUTER-INTEGRATED APPAREL ENTERPRISE
(CIAE)
PPFG-T5-P4, Phase I

Contract Number	SPO100-95-D-1003
Contractor	Georgia Tech Research Corporation
Delivery Order #	0005
Delivery Order Title	Develop & Implement an Integrated Enterprise Info System for a CIAE
CDRL #	A005
CDRL Title	Final Technical Report
Reporting Period	September 16, 1996 – November 3, 1997
Report Date	January 24, 1998
Name of PI	Dr. Sundaresan Jayaraman
E-mail	sundaresan.jayaraman@tfe.gatech.edu
Phone	404/894-2490
Fax	404/894-8780
Address	School of Textile & Fiber Engineering 801 Ferst Drive, MRDC Suite 3501 Atlanta, Georgia 30332-0295

Georgia Tech Project #: E-27-699

SJ-TR-CIAE-9801

<u>Research Project Personnel</u>

Annajee Rao Nott
Rangaswamy Rajamanickam
Research Investigators

Lynn Langston
Graduate Research Assistant

Sundaresan Jayaraman
Principal Investigator

Table of Contents

Acknowledgments

Executive Summary

ARN-AIMS is an apparel information management system developed as part of Phase I of ARN Project PPFG-T5-P4. Currently, it consists of three modules – Order Processing, Order Tracking and Shipping & Invoicing. The Order Processing Module is designed to facilitate the entry of customer orders for stock and special measurements for both military and commercial products. The Order Tracking Module helps the defense apparel manufacturer (DAM) track the status of an order in any part of the enterprise – from order entry through invoicing -- and identify bottlenecks in the system. It helps the DAM respond easily to inquiries from the customer (e.g., the Defense Personnel Support Center, DPSC). The Shipping & Invoicing Module generates an invoice (e.g., DD250) based on the order information entered in the system. ARN-AIMS runs on IBM-compatible machines in Microsoft Access for Windows 95.

ARN-AIMS has been successfully implemented at three DAM sites: The New Maryland Clothing Company in Baltimore, Maryland, DeRossi & Son in Vineland, New Jersey, and Gibraltar P.R. Clothing in San Lorenzo, Puerto Rico. Prior to the implementation of ARN-AIMS, the Delivery Orders from DPSC were entered and processed either manually or using a spreadsheet. Order Tracking in the enterprise was done manually and there was no formal system in place. The generation of invoices (DD250) was yet another time-consuming and labor-intensive process often requiring the reentry of Contract/Delivery Order information that was originally entered during the Order entry process, leading to errors. The Order Entry/Processing, Order Tracking and Shipping/Invoicing operations were heavily dependent on the one or two individuals associated with those operations.

Since the implementation of ARN-AIMS, the Order Entry/Processing time has been reduced from approximately 115 minutes to 30 minutes for a single Delivery Order -- a 74% reduction. The time associated with tracking an Order and responding to a *single* query from DPSC on a Delivery Order has been reduced from approximately 200 minutes to 5 minutes -- a 97% reduction. The time for invoicing (preparation and generation of DD250 forms) has been reduced from 140 minutes to 15 minutes -- an 89% reduction. The metrics represent a composite view of the timesaving at the three locations. Note: the Order Tracking module has not been implemented at DeRossi & Son. In addition to these tangible savings, ARN-AIMS has reduced the need for duplicate data entry (and associated errors), reduced the amount of manual paper exchange and helped the enterprise organize and enforce a consistent cut scheduling process.

In short, ARN-AIMS is enabling the DAM to obtain information "on demand" and use it very effectively for running the enterprise. ARN-AIMS paves the way for realizing an information-integrated supply chain (IISC) in the production and distribution of military clothing items -- one of the primary goals of the DLA-ARN Program.

1. INTRODUCTION

A Computer-Integrated Apparel Enterprise (CIAE) is a prerequisite for realizing the vision of customer-driven uniform manufacture (CDUM) for delivering form-fitting uniforms of the *right* quality in the *right* quantity at the *right* price and at the *right* time to the US Armed Forces. A seamless integration of the various components in the supply or value chain is essential for achieving quick response at the manufacturing end and readiness at the customer end.

The primary purpose of this research effort is to design, develop and implement an information management system for Ordering, Tracking and Shipping in a Special Measurement/Quick Response environment based on the *building blocks* provided by the Apparel Manufacturing Architecture (AMA) [1, 2]. The second major objective is to test the AMA Compliance Process being developed as part of the AMA/RICA Maintenance and Enhancement Project. Yet another objective is to explore the integration of the developed Information System with the Automated Order Processing Module (AOPM) being developed by EDI Integration Corp., so that the foundation for the seamless flow of information in order management in a defense apparel manufacturing enterprise will be laid. The developed system will be implemented in a DEMO Center (Clemson Apparel Research) and at the sites of two Defense Apparel Manufacturers (DAMs) – Haas Tailoring and Maryland Clothing.

The proposed user friendly system will be extremely useful to DAMs since they currently do not have such information management systems for the targeted functions in the enterprise. In the future, similar modules for other functions (e.g., production planning, scheduling, etc.) will be developed using the AMA building blocks.

1

2. THE AMA BUILDING BLOCKS

The AMA Information model was developed to serve as the database schema for a Computer-Integrated Apparel Enterprise. The model provides a coherent definition of the data maintained by an apparel enterprise [1, 3]. The Information model consists of a set of entity-relationship diagrams and a data dictionary. The model is broken up into several functional views, each of which represents a particular aspect of the enterprise operation. These views remain parts of the same model because they share common entity definitions. Each functional view can be spread over multiple diagrams that are connected through *page-connectors*. The node number and the title of the functional view are printed at the bottom of each diagram [3, 4].

The AMA Information model defines the structure of the entities generated and processed by the functions of the apparel manufacturing enterprise and the relationships that exist between these entities. The functional views represented in the model are as follows:
1. Marketing and Product Development
2. Enterprise Support Services
3. Planning and Preparation for Production
4. Production Control
5. Manufacturing
6. Distribution

The AMA Information Model spans all the enterprise functions that fall within the defined scope of the architecture. Likewise, the Recruit Induction Center Architecture (RICA) spans all the activities associated with uniform distribution at a Recruit Induction Center (RIC) [5].

3. FEATURES OF THE INFORMATION SYSTEM

The information system is titled ARN-AIMS (*A*pparel *R*esearch *N*etwork -- *A*pparel *I*nformation *M*anagement *S*ystem), since it is funded by the Apparel Research Network (ARN) program of the Defense Logistics Agency (DLA). The objective of the ARN is to significantly improve the U.S. apparel industry's ability to meet Department of Defense (DoD) requirements through research, development, and technology transfer for the apparel and related industries, such as distribution, equipment, and materials suppliers.

3.1   ARN-AIMS Development Cycle

Figure 3-1 shows the evolution of ARN-AIMS from the basic AMA building blocks to the final product. This figure also illustrates each milestone in the transformation from the AMA building blocks to ARN-AIMS and the associated times.
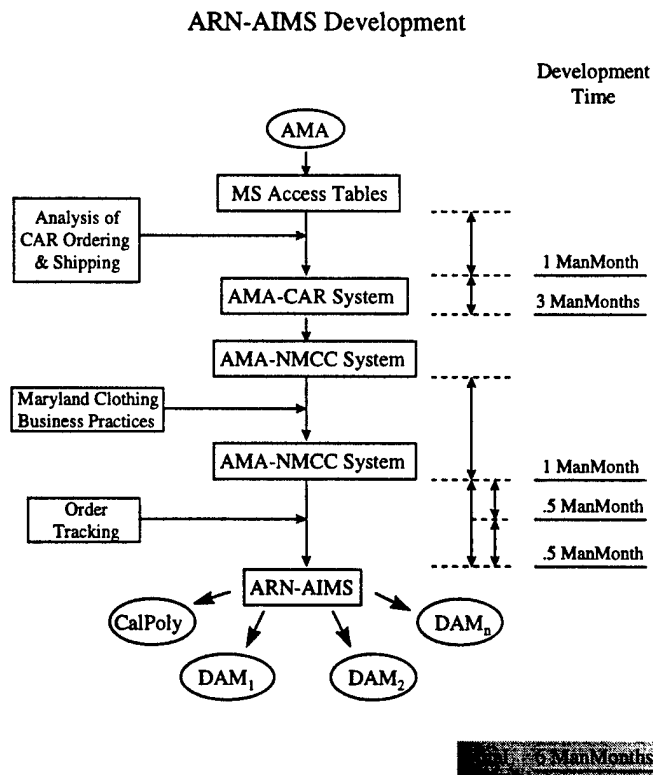

Figure 3-1 ARN-AIMS Development

3

During the initial stages of system development, approximately one month was spent at the Clemson Apparel Research Center (CAR) studying the ordering and shipping processes. CAR produces long and short sleeve shirts for the Army and Air Force. The design of the initial system was based on the AMA building blocks created in Microsoft Access and the process information gathered at CAR.

The *alpha* version of the software was created in approximately three months and then shifted to the Maryland Clothing business environment. The user input and information gathered at Maryland Clothing through AS IS modeling were instrumental in the further development of the system as a more flexible application, which could be implemented at other apparel facilities. The enhancements and changes required for implementation and acceptance at Maryland Clothing were mostly related to the user interface and addition of a few attributes. The most significant enhancement to the system was the addition of the *tracking module*. ARN-AIMS runs under Windows 95 on a Pentium or IBM-compatible machine with MS Access and EasyForm 250 Software.

Prior to implementation at Maryland Clothing, ARN-AIMS was extensively tested using sample data to identify and correct any bugs in the system. The testing included checks for logical inconsistencies in the operation of the system as well as syntactical errors generated during the development process.

3.2   Functional Specifications of ARN-AIMS

The functional specification describes the functionality that ARN-AIMS is required to provide. The ultimate goal of ARN-AIMS is that it facilitates the process of customer-focused ordering, manufacturing, and distribution.

3.2.1   Application Specifications

- Reduce the amount of physical paperwork required for the order entry, tracking, and shipping processes.
- Enter any piece of information only once; avoid re-entry of data.
- Increase the efficiency of the order entry, tracking, and shipping processes.
- Design the system to be flexible enough for the convenient development of other modules based on AMA/RICA that are not yet implemented. Make it flexible enough for the development of new modules.
- The information infrastructure of the system must maintain referential integrity by ensuring that all data is normalized.
- A standard and easy to understand naming convention should be employed in the underlying architecture. This ensures that all developers can quickly master and manipulate the entities and attributes of the infrastructure.
- The system must be user-friendly.
- The software must maintain a consistent format from view to view.

- The information must follow a logical flow based on the represented process.
- The system must be generic enough for implementation across any enterprise requiring minimal customization.
- The system must manage the information for special measurements, stock, commercial, and other military orders.
- The code required for the user interface must be contained in a single software development package.

3.2.2 Module Specifications

The desired system functionality has been achieved in three modules: Ordering, Tracking, and Shipping. The specific functional requirements for each module are as follows:

Ordering Module

- Expedite the entry of contract information.
- Facilitate entry for regular delivery orders -- both military and commercial sector orders.
- Facilitate entry of an individual's information for the fulfillment of a customer-focused order or special measurement order.
- Provide a convenient and swift method for retrieving information pertaining to contracts, delivery orders, line items, and individual information.
- Reduce the amount of paperwork required for maintaining the information related to the ordering process.

Tracking Module

- Enforce the information connection between a delivery order line item and a production order, which ensures a reliable method of tracking.
- Facilitate the propagation of a delivery order line item through the processes between ordering and shipping.
- Monitor a delivery order line item as it passes through the enterprise's processes.
- Provide a convenient querying method of line item information.
- Present a querying method that is easily customized to meet the user's information needs.

Shipping Module

- Halt the occurrences of shipping without invoicing, which result in reconciliation and a loss of revenue to the enterprise.
- Facilitate the assignment of any specific delivery order line item to an invoice.
- Provide a method for automatically assigning cost information and calculating line item totals for an invoice.
- Expedite the automatic generation of an invoice.

3.3   System Description

The goal and function of each software module in ARN-AIMS and the information flow within and between the modules are discussed in this section. The system was designed and developed to meet the functional specifications laid out in the previous section.

Ordering Module

The ordering module is designed to facilitate the entry of customer orders for custom, stock, military, and commercial orders. The ordering module maintains the information for the components shown in Figure 3-2. The system does not constrain the user to the flow, but allows the user to leap into the system at the designated points. Currently, order information is entered manually by an operator, but the system is designed to accommodate the installation of an Electronic Data Interchange (EDI) system.

```
        ┌──────────────┐
        │  Contracts   │  ◄──── * start point
        └──────────────┘
               │
               ▼
        ┌──────────────┐
        │Delivery Orders│ ◄──── * entry point
        └──────────────┘
               │
               ▼
        ┌──────────────┐
        │Delivery Order │
        │  Line Items   │
        └──────────────┘
               │
               ▼
        ┌──────────────┐
        │ Individual's  │ ◄──── * entry point
        │ Information   │
        └──────────────┘
               │
               ▼
  ┌────────────────────────┐
  │      Individual's      │
  │ Measurement Information │
  └────────────────────────┘
```
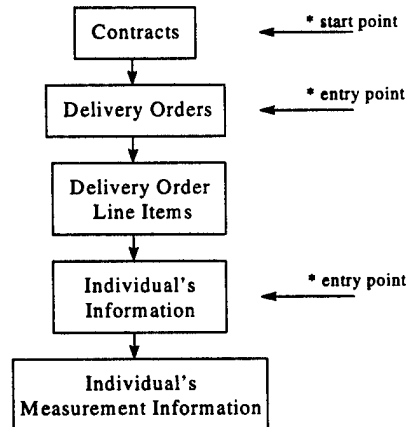
Figure 3-2 Information Flow and Components of the Ordering Module

- Contracts - This section is used for the entry of the contract name, beginning contract date, and any fixed information projected at the start of the contract. Once a contract has been entered, delivery orders can be added under that contract name at any time.

- Delivery Orders - Every delivery order belongs to a particular contract. It contains the delivery order name, number, and order date. The delivery order functions as the center of ARN-AIMS, because it is the launching point for cut orders and the generation of information for the invoice, DD250. This design correctly represents the practice of an *order-driven* enterprise.

- Delivery Order Line Items - All line items associated with a particular delivery order are entered at this point. The line items are distinguished by the delivery order number, line item number and the due date for the line item. The information

6

required for the line item will be different depending on the type of order. For example, commercial or military. The status is automatically updated to "entered" on the delivery order form as the item is entered into the system.

- Individual Information - If the delivery order is for special measurement, the system requires information about the individual. Basic individual information (name, height, and weight) and special measurements are entered in the following section. This information is automatically related to the particular line item.

- Individual measurement information - The measurement items needed for a particular individual are based on the sex of the recruit and type of garment to be produced. The measurement information can be adjusted to suit any garment requirements.

Shipping Module

The shipping module is designed to utilize the delivery order information already in the system and combine it with a garment price provided at the time of shipment to automatically generate an invoice. The status of the line item is automatically updated to "invoiced" once the line item has been assigned. The only new information the user is required to input to the system is payment information, pricing, and carton assignments. A DD250 (invoice) can be automatically generated from this module at any point after the line items have been placed on the invoice.

```
                    ┌──────────────────┐      * entry point
                    │  Shipping Notice  │ ◄───────────────
                    └──────────────────┘
                            │
                            ▼
                    ┌──────────────────┐
                    │  Shipping Notice  │
                    │  Line Items       │
                    └──────────────────┘
                            │
                            ▼
            ┌──────────────────────────┐
            │  External DD250 for       │
            │  Editing and Printing     │
            └──────────────────────────┘
```
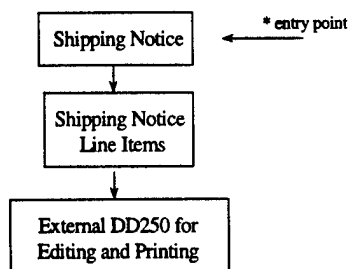
Figure 3-3 Information Flow and Components for the Shipping Module

- Shipping Notice - The first step involves the automatic creation of an invoice. The shipping notice component acts as the overall invoice and contains one or more shipping notice line items. The only constraint for a line item is that it must be from

7

the same contract and must be destined for the same shipping location as other line items on the same invoice.

- Shipping Notice Line Item - Each line item requires costing information and if applicable, carton assignments. At this point, the status is updated to "invoiced".

- DD250 - A DD250 form for editing and printing is generated and opened in an invoicing software package, the EasyForm DD250. This makes it easy for the user to quickly edit and update information pertaining to the invoice.

Tracking Module

The Tracking Module provides status information for every delivery order line item in the system, quickly and easily. This module enforces the relationship between the delivery order line items and the production orders. It also makes use of data inputs from the ordering and shipping modules, plus three other components: Marker Making, Manufacturing, and Cutting. The status for a line item is automatically updated as the required information is entered at each stage of the process. The tracking module is designed to be flexible so that the user can search for line items based on any desired criteria and always see the status and any pertinent information.

```
┌─────────────────┐
│ Ordering Module │ ◄──── * entry point
└─────────────────┘
         │
         ▼
┌─────────────────┐
│     Marker      │ ◄──── * entry point
│     Making      │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│     Cutting     │ ◄──── * entry point
└─────────────────┘
         │
         ▼
┌─────────────────┐
│  Manufacturing  │ ◄──── * entry point
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Shipping Module │ ◄──── * entry point
└─────────────────┘
```
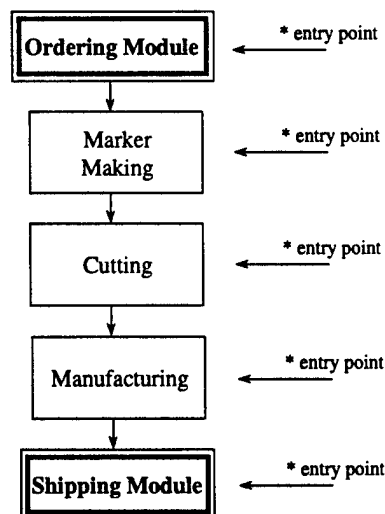
Figure 3-4 Information Flow and Components of the Tracking Module

- Ordering Module - A full description has been given in a previous section. The status of an item is updated to "entered" once the line item is placed on a delivery order in the system.

8

- Marker Making - This component allows the user to schedule any combination of orders on a marker. The status of an order automatically changes from "entered" to "marked" when a line item is assigned to a marker.

- Cutting - This component allows the user to schedule any combination of orders on a cut, name the cut, schedule the priority and status, and enter the start and finish dates. This will be useful later when pinpointing problems, bottlenecks, and answering inquiries. The status of an order automatically changes from "marked" or "entered" to "cutting" when a line item is assigned to a cut. If the line item has not reached one of these initial statuses then cutting cannot be scheduled.

- Manufacturing - The only new information required from the user is the actual finish date for the cut. The user simply updates the status to "mafg" with the click of a button.

- Shipping Module - A full description has been given in the previous section. The status of an item is updated to "invoiced" when the user assigns the line item to a delivery order.

3.4   User Interface and Organization

A standard screen design and naming convention has been utilized throughout the system. Table 3-1 defines the standard naming conventions for some of the data elements in the system.

This naming convention facilitates querying and tracking. The user can find data by entering portions of a contract name, a delivery order number, or an invoice number at any stage in the system.

All the screens share a common layout and organization. Table 3-2 gives the descriptions of these three basic types and defines the organization for these different screen types. The Main Menu, Invoice screen, and Customer Information Form can be found in Figures 3-5, 3-6, and 3-7, respectively.

The Main Menu shown in Figure 3-5 is a typical example of the layout of all the menus in ARN-AIMS. The titles of the menus are always displayed across the top of the screen and the options for each menu are listed below the title in the form of buttons. The buttons always have a text definition displayed beside or directly on the surface. There is no data entry associated with any of the menus.

9

Table 3-1 ARN-AIMS Data Element Representation

Data Element	Representation	Example
Contract	Contract/Option	SPO100-94-D-0123/1
Delivery Order	Contract/Option/Delivery Order	SPO100-94-D-0123/1/0001
Invoice	Contract/Option/Delivery Order/Invoice	SPO100-94-D-0123/1/0063/0001

Table 3-2 ARN-AIMS Basic Screen Design and Organization

| Screen Type	Example	Button Position	Button Descriptions	Date/Time Position	Screen's Primary Key	Date for Entry	Data Entered
Menu	Main Menu (Figure 3-5)	Left Side	Right of Button	None	N/A	N/A	N/A
Large Screen Data Entry	Invoice screen (Figure 3-6)	Bottom of Screen	Top of Button	Bottom of Screen	Top of Screen	Top Section of Data	Bottom Section of Data
Small Screen Data Entry	Customer Information (Figure 3-7)	Right Side	Left of Button	Bottom of Screen	Top of Screen	N/A	Entire Screen
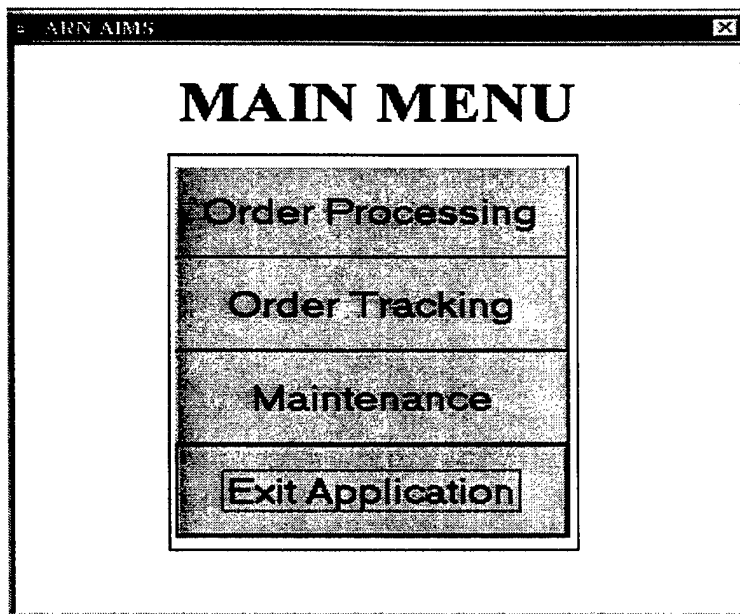
Figure 3-5 Menus: ARN-AIMS Main Menu

Data entry on large screens involves a combination of single text boxes, information displayed in small window-like screens, and buttons. The Invoicing screen in Figure 3-6 is an excellent example of large screens used for data entry in ARN-AIMS. The middle of the top box always contains the name of the current record displayed, in this case SPO100-97-D-1234/1/0001/0001. Occasionally, there is information pertinent to the large screen; for example, Shipping Date text box, Paid by text box, etc. These text boxes contain information that is important for the entire invoice. The first window labeled "Items for Shipping subform" is where all items ready for invoicing are displayed. The second window displays all items that have been scheduled for the current invoice. The buttons used for data manipulation are displayed across the bottom of the screen. Also, at the very bottom of the screen, the date and time are always displayed.

Figure 3-6 Large Screen Data Entry: ARN-AIMS Invoicing Screen

As shown in Figure 3-7, small screen data entry requires fewer information items and operations than the large data entry screens. The current record remains at the top of the screen, but the buttons are moved to the right side of the screen. Data requirements are displayed under the record in a logical sequence for entry.

Figure 3-7 Small Screen Data Entry: ARN-AIMS Administered DODAAC Information Screen

All data and screen manipulation is executed through the use of buttons in the user interface. There are a few basic button designs that are utilized in the system to make maneuvering simple and easy to learn. Figure 3-8 shows these buttons and their basic definitions in the system.

Contract and Delivery Order Information

Marker Making Information

Cut Scheduling Information

Manufacturing Information

Invoicing Information

Return to Previous Form

Close Form

Delete Record

Recruit and Recruit Measurement Information

Customer Information

Shipping Location Information

Add a Record

Delete a Record

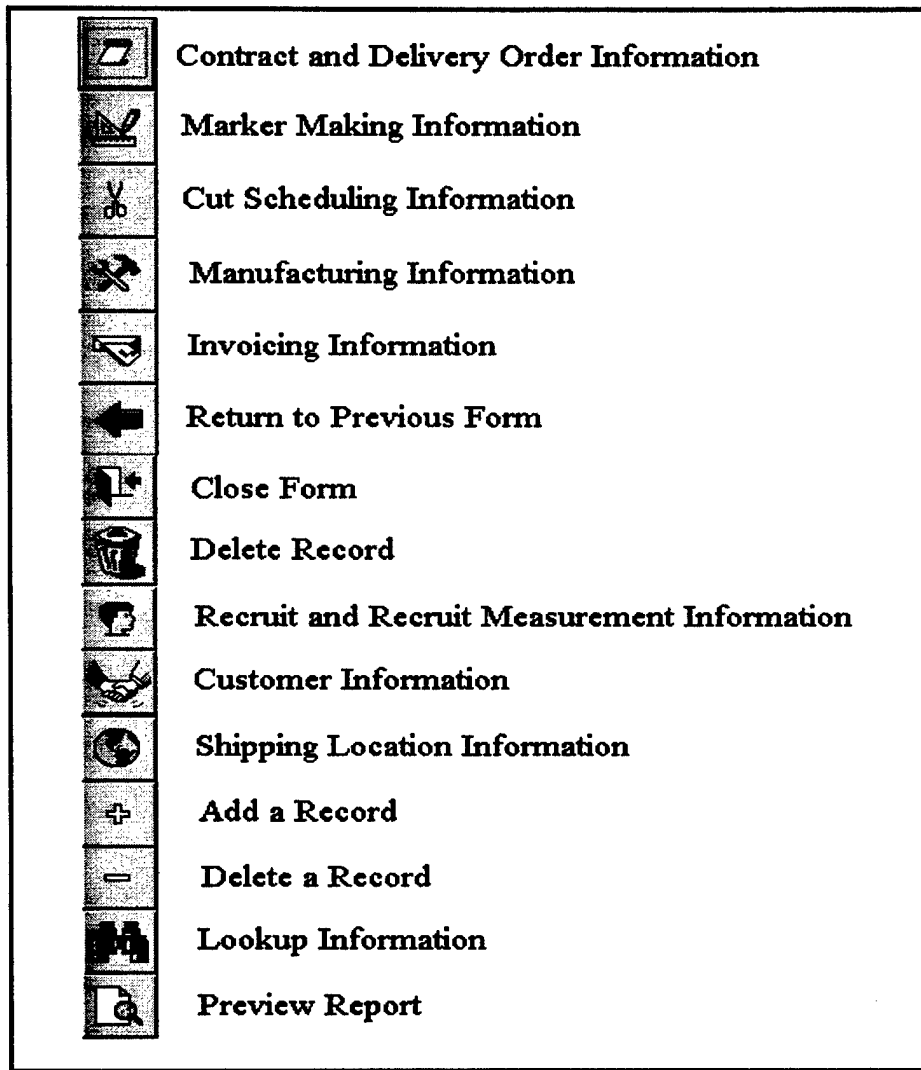Lookup Information

Preview Report

Figure 3-8 ARN-AIMS Button Definitions

4. FIELD IMPLEMENTATIONS OF ARN-AIMS

The planned initial implementation sites for ARN-AIMS were Clemson Apparel Research, Haas Tailoring and Maryland Clothing. This list was later expanded to include the Apparel Technology and Research Center (ATRC) at California State Polytechnic University, DeRossi & Son, and Gibraltar Clothing P.R. Inc.

Haas Tailoring was dropped from the list of implementation sites due to the presence of a legacy information system that could not be easily adapted to integrate with ARN-AIMS.

4.1   Defense Apparel Manufacturers

The New Maryland Clothing Manufacturing Co. Baltimore, MD, is a leading producer of dress coats for the United States Army. Maryland Clothing fills special measurement orders, regular stock orders, and commercial cutting orders. Currently, there are approximately 150 employees on the manufacturing floor, who produce around 2,000 coats per week. Annually, they are producing upwards of 1,500 special measurement orders. Therefore, the New Maryland Clothing Manufacturing Co. was chosen as the ideal implementation site for ARN-AIMS.

After the initial success of ARN-AIMS at Maryland Clothing, DeRossi & Son expressed an interest in implementing the system. Therefore, it was chosen as the second DAM site for ARN-AIMS.

DeRossi & Son in Vineland, NJ, manufacture coats and trousers for the United States Army and Navy. They primarily concentrate on stock orders and manufacture approximately 3000 pieces per week and employ around 200 operators

Following a presentation on ARN-AIMS at the DPSC Technology Modernization Conference in June 1997, Gibraltar Clothing expressed an interest in ARN-AIMS. Therefore, it was chosen as the third implementation site for ARN-AIMS.

Gibraltar Clothing P.R. Inc. fills special measurement orders, regular stock orders, and commercial cutting orders for the US Army, Navy and Marine Corps. Currently, there are approximately 150 employees on the manufacturing floor, who produce around 3,000 pieces per week.

4.2   Demo Centers

The Apparel Technology Research Center (ATRC) at California State Polytechnic University is a DLA Demo Center in the ARN Program and it served as an additional test site. The ATRC is a new facility that produces Marine long and short sleeve shirts, Marine maternity wear, and various dresses and shirts for commercial organizations. ATRC produces only stock orders currently, but will eventually incorporate special measurements into its range of products. This test site was used to prove the value and advantage of the building block approach by implementing (at ATRC) the *same* information system that was implemented at Maryland Clothing.

Clemson Apparel Research (CAR) is a DLA Demo Center in the ARN Program. CAR produces long and short sleeve shirts for the Army and Air Force. The design of the initial system was based on the AMA building blocks created in Microsoft Access and the process information gathered at CAR. Following the success of ARN-AIMS in the field, CAR became an additional implementation site.

Maryland Clothing, ATRC and CAR are also implementing new data interchange and manufacturing practices. In the near future, Electronic Data Interchange (EDI) will be implemented to handle all of the ordering and possibly all of the shipping and invoicing. Also, Maryland Clothing has begun to implement *modular* manufacturing on the sewing floor. This practice is a common manufacturing enabler for an enterprise practicing quick response. A reliable and flexible information system is needed to handle the current information needs and eventually to facilitate the information flow associated with the new manufacturing processes and new data interchange and ARN-AIMS fulfills this role very effectively.

5. ARN-AIMS: EVALUATION AND ANALYSIS

In this section, the performance of ARN-AIMS in carrying out the order processing, tracking, and shipping activities is evaluated. The evaluation is based on observations and discussions with users. A cost-benefit analysis is also performed which compares the architectural approach for system development (AMA-based) to an ad hoc approach to system development.

5.1   Time Benefits

Tables 5-1 through 5-5 present the time required for carrying out information-related tasks before and after the implementation of ARN-AIMS at Maryland Clothing and DeRossi & Son. The data have been gathered based on discussions with personnel at Maryland Clothing and DeRossi & Son. The largest amount of time was spent on physically sending and receiving paperwork between individuals in the enterprise. Also, data was entered multiple times when generating a cut report and an invoice. ARN-AIMS provides the user with a better method for exchanging information and creating reports and invoices. The lapsed timesaving from ARN-AIMS is very significant.

The values shown for "Time with ARN-AIMS" are times based on initial testing of the system at Maryland Clothing and DeRossi & Son.

5.2   System Functionality

ARN-AIMS must meet specific criteria in the area of system functionality. Table 5-6 lists these criteria and the corresponding rating on a scale of 1 to 5. In the rating scale, 1 = excellent, 2 = good, 3 = average, 4 = poor, 5 = bad. For example, the rating of 1 for the 'Prevents duplicate data entry' criterion means ARN-AIMS is "excellent" in preventing duplicate data entries. This system functionality evaluation was conducted at Maryland Clothing.

The users at Maryland Clothing agreed that all the information pertinent to their facility could be entered and displayed in appropriate and easy-to-understand modules. Maryland Clothing handles several different types of orders and the system has the ability to manage the information flow for all types: Customer-focused or Special-measurement orders, stock orders, and commercial and military orders for cutting.

ARN-AIMS facilitates the quick and simple lookup of orders based on the information that is important to Maryland Clothing: A recruit's last name, a requisition number, and an NSN code. It is also useful for tracking a line item from the order entry process all the way through the shipping and invoicing processes. Finally, the system automatically

17

Table 5-1 Delivery Order Entry and Processing (Maryland Clothing)

Steps	Time Without ARN-AIMS	Time With ARN-AIMS	Projected Time Savings
Enter Delivery Order Information	45 min	25 min	20 min
Make Copies for Distribution	10 min	0	10 min
Pass Information	5 min	5 min @	0
Perform Size Verification	20 min	20 min	0
Develop Cut Schedule	30 min	30 min	0
Wait for Response (Lapsed time)	1 hour - 2 days	1 hour - 2 days	0
Assign Cut Numbers	5 min	1 min	4
Enter Size Code Information	5 min	1 min	4
Create Cut Report	30 min	1 min	29
Total Time Savings			**67 min**

@ This time will disappear when ARN-AIMS is networked to include Cutting on-line.

Table 5.2 Order Tracking (Maryland Clothing)

Steps	Time Without ARN-AIMS	Time With ARN-AIMS	Projected Time Savings
Responding to DPSC's Query on a Specific Order	60 min	1 min	59 min
Tracking Order on Shop-Floor	60 min	1 min	59 min
Order fulfillment Status (number produced, number remaining, ...)	10 min	1 min	9 min
Billing Inquiries (whether MD Clothing has been paid, etc.)	10 min	1 min	9 min
Has the Order been billed to the Government?	15 min - 2 hours	1 min	14 min - 2 hours
Total Time Savings			**140 min - 4 hr 15 min**

The data in this table are for ONE inquiry per Delivery Order; there may be multiple inquiries per Delivery Order.

Table 5.3 Shipping (Maryland Clothing)

Steps	Time Without ARN-AIMS	Time With ARN-AIMS	Projected Time Savings
Gather Information for Invoicing	20 min	0	20
Pass Information	5 min	0	5
Check Information for Correctness	15 min	0	15
Pass Information	5 min	0	5
Type Information into Software	5 - 15 min	5 min	10
Pass Information	5 min	0	5
Cross-check Typed Information	5 min	0	5
Pass Information	5 min	0	5
Record Invoicing Information	5 min	0	5
Total Time Savings			**75 min**

Table 5-4 Delivery Order Entry and Processing (DeRossi & Son)

Steps	Time Without ARN-AIMS	Time With ARN-AIMS	Projected Time Savings
Enter Delivery Order Information	105min	30min	75 min
Make Copies for Distribution	10 min	0 min	10 min
Assign Cut Numbers	15 min	5 min	10 min
Total Time Savings			95 min

Table 5.5 Shipping (DeRossi & Son)

Steps	Time Without ARN-AIMS	Time With ARN-AIMS	Projected Time Savings
Gather Information for Invoicing	60 min	0	60 min
Pass Information	60 min	0	60 min
Check Information for Correctness	30 min	0	30 min
Pass Information	0 min	0	0 min
Type Information into Software	30 min	15 min	15 min
Pass Information	0 min	0	0 min
Cross-check Typed Information	10 min	5	5 min
Pass Information	0 min	0	0 min
Record Invoicing Information	15 min	0	15 min
Total Time Savings			**185 min**

The data in the table is based on generating one DD250 for a Delivery Order; there will be multiple DD250s for a Delivery Order.

Invoicing has been a separate activity until now with extensive information handling and opportunities for error in rekeying of information and paper shuffling.

Table 5-6 Functionality Rating of ARN-AIMS

	Criterion	Rating
1.	Prevent duplicate data entry.	1
2.	Decrease the amount of manual paper exchange.	2
3.	Facilitate the entry of an individual customer's information for the fulfillment of a custom order.	1
4.	Facilitate the entry of measurement and size verification information for a customer's order.	1
5.	Organize all information for size verification and cutting.	2
6.	Organize and enforce a consistent cut scheduling process.	1
7.	Organize and enforce a standard cut naming process.	1
8.	Generate a cut report.	1
9.	Facilitate line item lookup.	1
10.	Track the cut start, target finish, and actual finish dates.	1
11.	Track the status of a line item at any stage in the order fulfillment process.	1
12.	Efficiently assign line items for an invoice from a delivery order.	1
13.	Generates an invoice automatically.	1

generates an invoice based on the information that has been entered during the order entry process.

5.3   User Interface

There are also specific criteria that ARN-AIMS must meet from a user interface standpoint. Table 5-7 lists these criteria and the corresponding ratings using the same scale as before.

ARN-AIMS operates in a logical manner that is familiar to the user. It also maintains a consistent format from screen to screen. The buttons are the primary tools for manipulation in the system. Like buttons maintain similar functions from screen to screen. The standardized layout and design of the interface allow actions such as adding, deleting, and finding information to be the same throughout the system.

Elementary error checking is incorporated into the interface to prevent mistakes during data entry. Custom messages have also been included to help with the interpretation of errors. However, semantic errors (such as incorrect contract numbers) cannot be completely prevented by the system. The User's Guide provides detailed information about the use of the system (See Appendix). It is particularly helpful during the learning phase, because it guides the user through each action in the system.

5.4   System Architecture

ARN-AIMS was developed following the architectural approach to system design and development using the AMA building blocks. The benefits and advantages of this approach over an ad hoc approach are presently discussed.

The building block approach increases the design flexibility of the system. Entities can be easily added or modified without affecting the integrity of the overall system. Relationships can also be modified or enhanced without affecting the integrity of the overall system. Normalization and referential integrity between these entities can be easily enforced because the building block approach provides a logical organized method for relating the entities.

The architectural approach makes *standardization* possible. The entities and attributes follow a consistent naming convention. This consistent naming practice facilitates learning for developers, and provides an efficient way for naming new entities and attributes that can be quickly understood. When all enterprises are operating based on the same architecture, quality communication between organizations will be easily facilitated. The development of the user interface also depends on the underlying foundation. It is much easier to develop a standard, consistent, logical, and flowing interface if the building blocks are in place.

24

Table 5-7 User Interface Rating of ARN-AIMS

	Criterion	Rating
1.	Consistent screen layout and design.	2
2.	Standard button functionality throughout the system.	1
3.	The system is easy to learn and utilize.	1
4.	Data entry and manipulation are uniform throughout the system.	1
5.	The system maintains a logical information flow based on the processes represented.	1
6.	Messages and errors are easy to understand and correct.	1
7.	Availability of a user's guide.	2
8.	Error checking to help prevent most of the invalid data from entering the system.	2
9.	De-skill the responsibilities associated with handling the order entry, manufacturing, and shipping information	1

5.5   Cost-Benefit Analysis

A cost-benefit analysis has been carried out for the development of information systems based on an architectural approach to system design and an ad hoc approach to system design. This information is shown in Tables 5-8 through 5-10.

Table 5-8 identifies the major steps in the development of an Information System along with the time, cost, and type of expertise required for the development of ARN-AIMS using the AMA building blocks as the underlying infrastructure. The corresponding metrics for developing a similar system without the AMA building blocks are also shown in the table. Since AMA provides the results of the first four activities listed in the table, no time and costs are incurred for these, and there is no need for special expertise in data modeling and process analysis when the architectural approach is adopted for system development. Moreover, the time and cost expenditures may be too high for most apparel companies who will be hard pressed to have in-house expertise in data process analysis and data modeling. Thus, by adopting the architectural approach with the AMA building blocks as the starting point, an apparel company can save nearly a person-year of effort and approximately $100,000 for developing a system such as ARN-AIMS.

Table 5-9 compares the cost of implementing ARN-AIMS at other apparel facilities with the cost of implementing additional (similar) systems developed without the AMA. The system developed without the AMA still requires some time spent in analyzing the new company's processes, developing entities, and creating appropriate views. The time values cited in the table for implementation of ARN-AIMS are very liberal. The implementation at the ATRC facility required only two days; additional building blocks in AMA were utilized to expand the functionality of ARN-AIMS. ATRC was a virtual "blank piece of paper" with no existing practices or legacy systems. This table proves that the standardized building block approach is more valuable than "re-inventing the wheel" or an ad hoc approach every time.

Table 5-10 illustrates yet another view of costs associated with system development for the two approaches. This table shows the costs associated with adding *new* functionality by developing new modules; for example, adding inventory management functionality. For the AMA-based system, the only significant amount of time and costs required are for the user interface development. However, for the system without the AMA, it is exactly like creating yet another module from scratch. The AMA already contains modules and building blocks to handle all the apparel enterprise's needs. To develop a system that has the same capability as the AMA-based system, an extra year must be spent as shown in the table.

26

Table 5-8 Information System Development:

Importance of Architectural Approach and AMA Compliance for the First System

Activity	Software Independent	Software Dependent	Available in AMA?	Time Invested without AMA (man-months)	Cost without AMA	Time Invested with AMA (man-months)	Cost with AMA	Needed Expertise
Definition of Data Entities	Yes		Yes	4	$38,400	0	$0.00	Process Analyst/ Data Modeler/ Domain Expert
Definition of Entity Relationships	Yes		Yes	3	$28,800	0	$0.00	Information Modeler/ Domain Expert
Creation of Database Tables	Yes		Yes	1	$9,600	0	$0.00	Database Manager
Definition of Views		Yes	Yes	1	$9,600	0	$0.00	Database Manager
Software Development		Yes		6	$57,600	6*	$57,600	Software Programmer
Customization/ Implementation /Testing		Yes		2	$19,200	1	$9,600	Software Programmer
TOTALS				17	$163,200	7	$67,200	

*Includes time for familiarization with AMA building blocks.

Table 5-9 Information System Development: Importance of Architectural Approach and AMA Compliance for Additional Implementations

Activity	Software Independent	Software Dependent	Available in AMA?	Time Invested without AMA (man-months)	Cost without AMA	Time Invested with AMA (man-months)	Cost with AMA	Needed Expertise
Definition of Data Entities	Yes		Yes	2	$19,200	0	$0.00	Process Analyst/ Data Modeler/ Domain Expert
Definition of Entity Relationships	Yes		Yes	1	$9,600	0	$0.00	Information Modeler/ Domain Expert
Creation of Database Tables	Yes		Yes	0.5	$4,800	0	$0.00	Database Manager
Definition of Views		Yes	Yes	0.5	$4,800	0	$0.00	Database Manager
Software Development		Yes		3	$28,800	0	$0.00	Software Programmer
Customization/ Implementation /Testing		Yes		2	$19,200	1.5	$14,400	Software Programmer
TOTALS				9	$86,400	1.5	$14,400	

Table 5-10 Information System Development: Importance of Architectural Approach and AMA Compliance for Additional System Functionality

Activity	Software Independent	Software Dependent	Available in AMA?	Time Invested without AMA (man-months)	Cost without AMA	Time Invested with AMA (man-months)	Cost with AMA	Needed Expertise
Definition of Data Entities	Yes		Yes	4	$38,400	0	$0.00	Process Analyst/Data Modeler/Domain Expert
Definition of Entity Relationships	Yes		Yes	3	$28,800	0	$0.00	Information Modeler/Domain Expert
Creation of Database Tables	Yes		Yes	1	$9,600	0	$0.00	Database Manager
Definition of Views		Yes	Yes	1	$9,600	0	$0.00	Database Manager
Software Development		Yes		6	$57,600	1.5*	$14,400	Software Programmer
Customization/Implementation/Testing		Yes		2	$19,200	1.5	$14,400	Software Programmer
TOTALS				17	$163,200	3	$28,800	

*Includes time for familiarization with AMA building blocks.

ARN-AIMS has been easily transported from one enterprise and implemented in another with minor customization because it is based on AMA -- architecture developed after an extensive and thorough analysis of apparel industry business practices [3]. Moreover, the expansion of the initial scope of the system by the addition of bundle ticket printing for ATRC illustrates the breadth and depth of AMA and the advantage of the architectural approach to information system development.

In summary, the performance of ARN-AIMS has matched initial expectations and the advantages of the architectural approach far outweigh an ad hoc approach to system development. The successful implementation at Maryland Clothing, DeRossi & Son and Gibraltar Clothing illustrate the usefulness of the system to DAMs as they strive to help the US DoD maintain the readiness of the Armed Forces. Also, it has provided an excellent starting point for developing a Computer-Integrated Apparel Enterprise (CIAE) that can support the business practices of the 21st century apparel enterprise.

6. ARN-AIMS AND THE AMA-COMPLIANCE PROCESS

After reviewing the AMA models and the AMA database Tables, it was determined that there was a need to add new entities (and attributes) or modify existing entities (and attributes) in AMA to create the module to meet the specific requirements of this Project. Therefore the following views were enhanced or added as a part of the AMA Compliance Process.

6.1   Enhancement of F-400 View

Figures 6-1 and 6-2 show the original Cut Order Planning views in AMA. The Sales Plan can be executed through n Production Orders. This relationship supports the practice of producing inventory ahead of time to meet customer demand. This is the key area where enhancements were made. Relationships between the other entities that were unchanged are also shown in the two views.
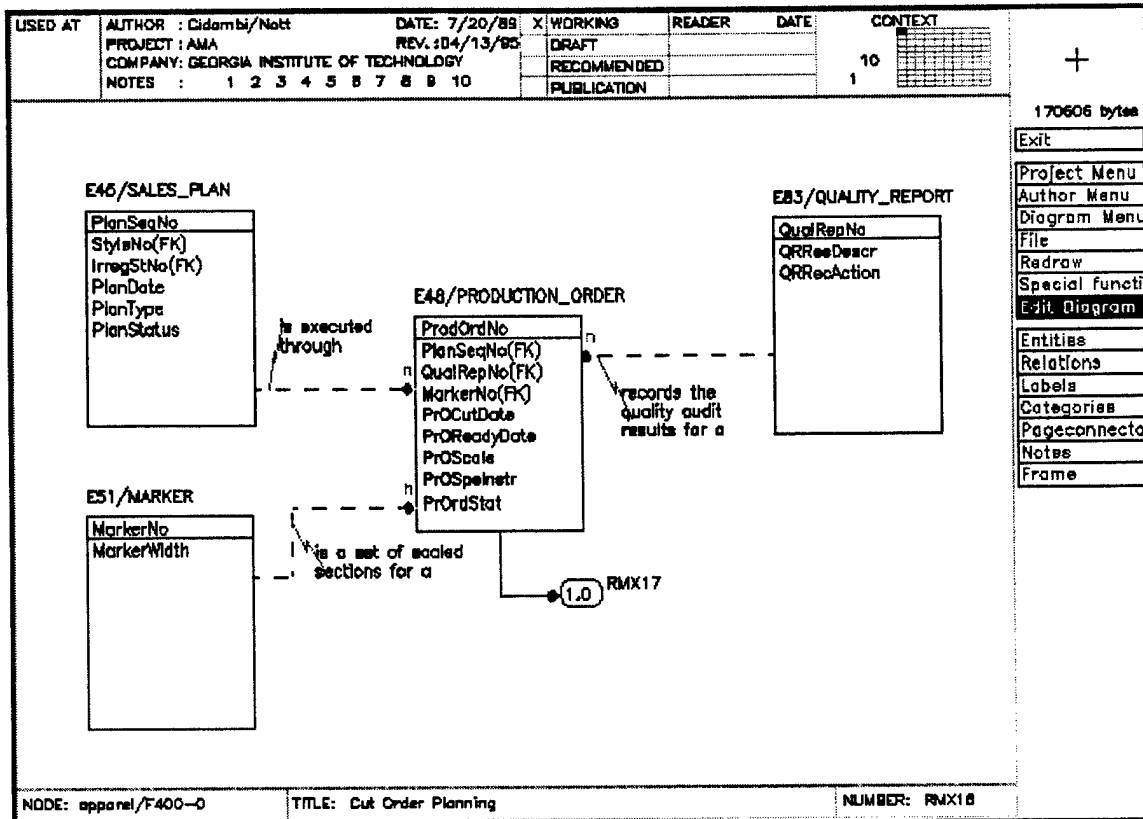
170606 bytes

Exit

Project Menu
Author Menu
Diagram Menu
File
Redraw
Special functi
Edit Diagram

Entities
Relations
Labels
Categories
Pageconnecto
Notes
Frame

E45/SALES_PLAN

PlanSeqNo
StyleNo(FK)
IrregStNo(FK)
PlanDate
PlanType
PlanStatus

is executed through

E48/PRODUCTION_ORDER

ProdOrdNo
PlanSeqNo(FK)
QualRepNo(FK)
MarkerNo(FK)
ProCutDate
ProReadyDate
ProScale
ProSpeInstr
ProOrdStat

E83/QUALITY_REPORT

QualRepNo
QRResDescr
QRRecAction

records the quality audit results for a

E51/MARKER

MarkerNo
MarkerWidth

is a set of scaled sections for a

(1.0) RMX17

NODE: apparel/F400-0 | TITLE: Cut Order Planning | NUMBER: RMX18

Figure 6-1. Original View: Cut Order Planning

USED AT	AUTHOR : Cidambi/Nott	DATE: 7/21/89	X	WORKING	READER	DATE	CONTEXT
	PROJECT : AMA	REV. :04/11/95		DRAFT			0
	COMPANY: GEORGIA INSTITUTE OF TECHNOLOGY			RECOMMENDED			11
	NOTES : 1 2 3 4 5 6 7 8 9 10			PUBLICATION			2

167110 bytes

Exit

Project Menu
Author Menu
Diagram Menu
File
Redraw
Special functi
Edit Diagram

Entities
Relations
Labels
Categories
Pageconnecto
Notes
Frame

E46/PLAN_ITEM
- PlanSeqNo(FK)
- PlanCusLotNo
- ColorCode(FK)
- MatCode(FK)
- PlanItemQty
- PlanItInstr

RMX16 (0.0)

E50/PROD_ORDER_ITEM
- ProdOrdNo(FK)
- ProdFabItNo
- PlanSeqNo(FK)
- PlanCusLotNo(FK)
- POItQty
- POItActQty
- PFSpeInstr

has

E53/MARKER_SECTION
- MarkerNo(FK)
- ScaSecNo(FK)

identifies the fabric on

has its size distribution specified as

Is spread for cutting as

is a template for cutting the

E7/SIZE
- SizeCode
- Waist
- Inseam

E49/SIZE_SCALE
- ProdOrdNo(FK)
- ProdFabItNo(FK)
- SizeCode(FK)
- SSProp
- SSActProp

specifies the size on

E98/SPREAD_SECTION
- ProdOrdNo(FK)
- SpreadSecNo
- ProdFabItNo(FK)
- SpFabLyrs
- SpFabActLyrs
- MarkerNo(FK)
- ScaSecNo(FK)

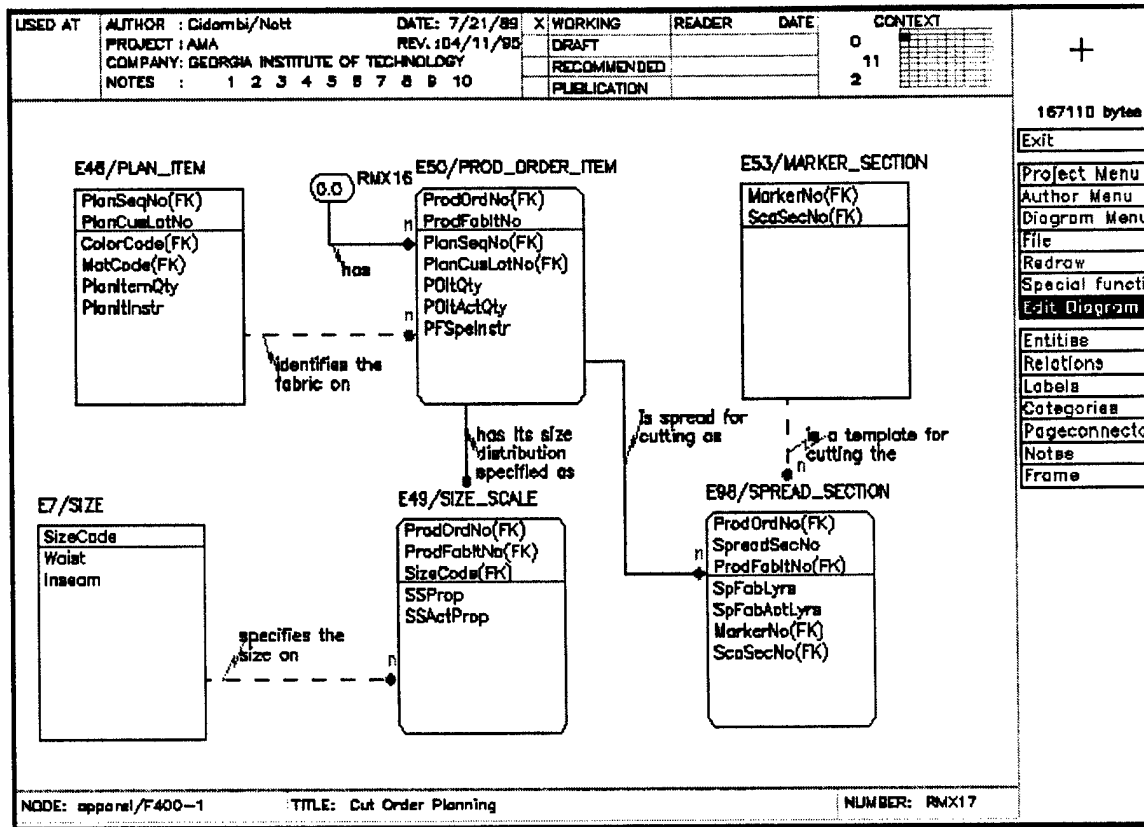| NODE: apparel/F400-1	TITLE: Cut Order Planning	NUMBER: RMX17

Figure 6-2. Original View: Cut Order Scheduling

The new view in Figure 6-3 (Cut Order Scheduling) encapsulates the key idea of moving from a mass production (inventory driven) enterprise to a mass customizing (order-driven) enterprise. The new relationship between Sales Plan and Shipping Order supports this shift. Since this view is central to the new paradigm of customer-driven manufacturing, it is placed before the Cut Order Planning views.
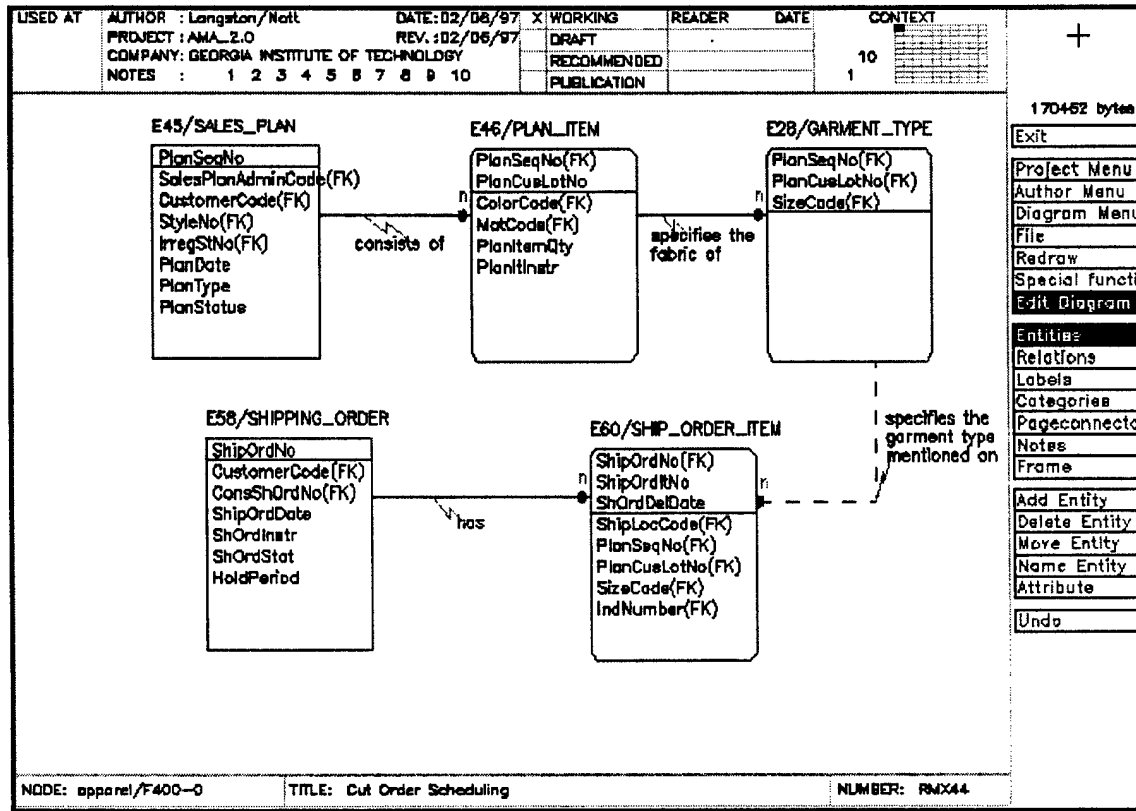

Figure 6-3. New View: Cut Order Scheduling

6.2 Enhancement of F405-0 and F405-1 Views

Figure 6-4 shows the enhanced Cut Order Planning view. The Sales Plan is no longer directly related to the Production Order, since it enforces the idea of an enterprise that produces items to stock inventory.
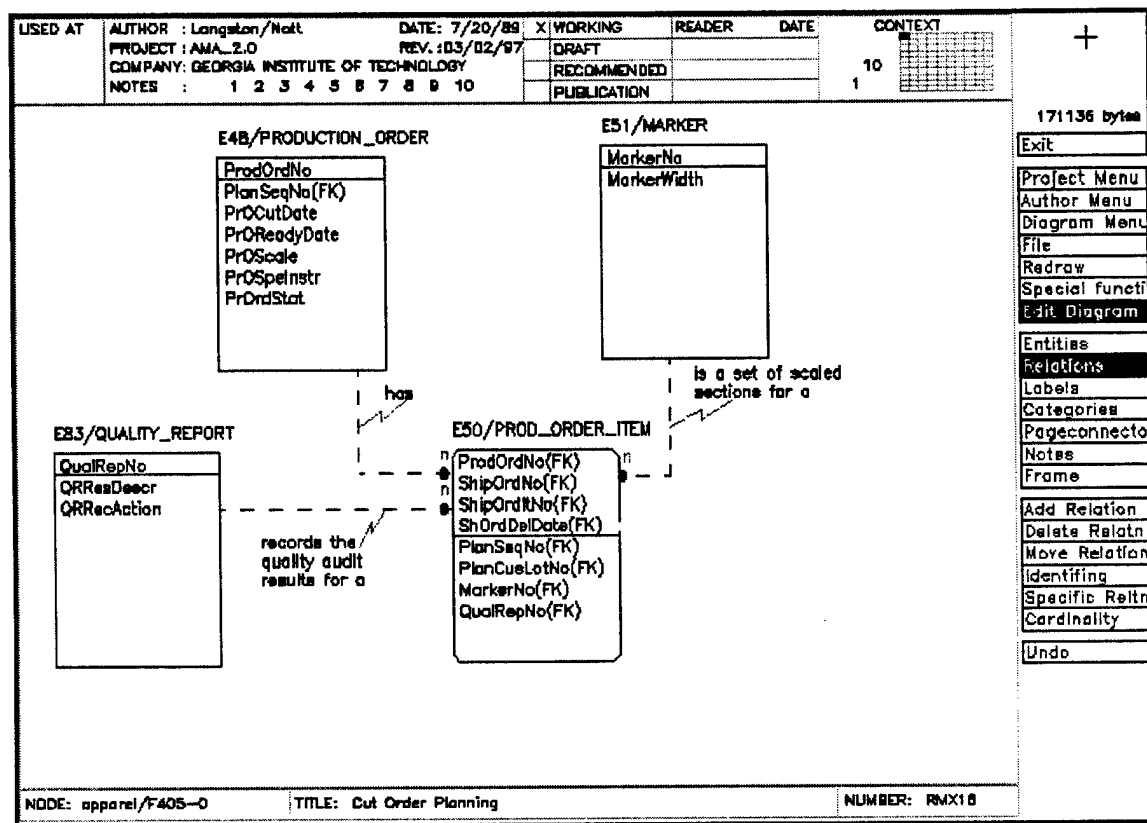
Figure 6-4. Enhanced View: Cut Order Planning

Figure 6-5, Enhanced View: Cut Order Planning, is the second of the Cut Order Planning views. It shows the correct representation of a Production Order Item unrelated to the Plan Item. This was a previous relationship (Figure 6-2) that supported an inventory-driven operation.
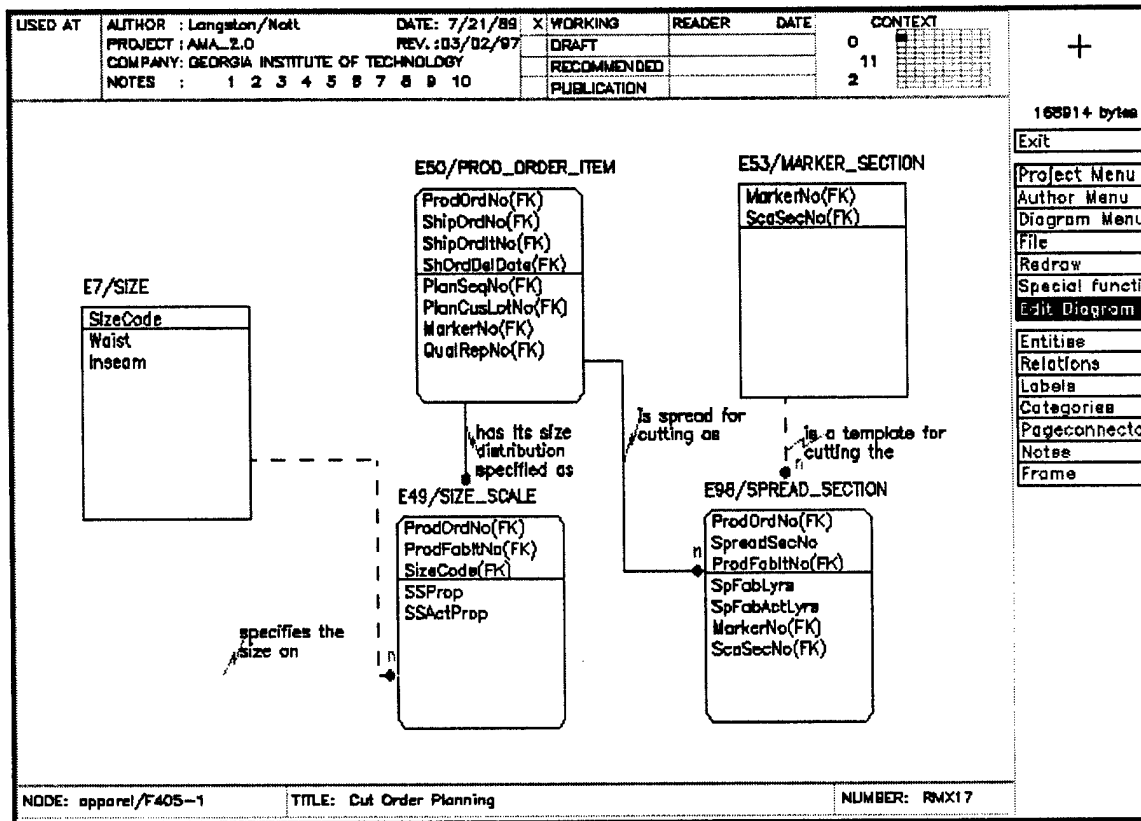
Figure 6-5. Enhanced View: Cut Order Planning

6.3   Enhancement of F420-0 View

Figure 6-6 shows the original Customer Interaction view, and Figure 6-7 is the enhanced Customer Interaction view. In the original view, there was no direct representation of the relationship between the Customer and a Sales Plan.
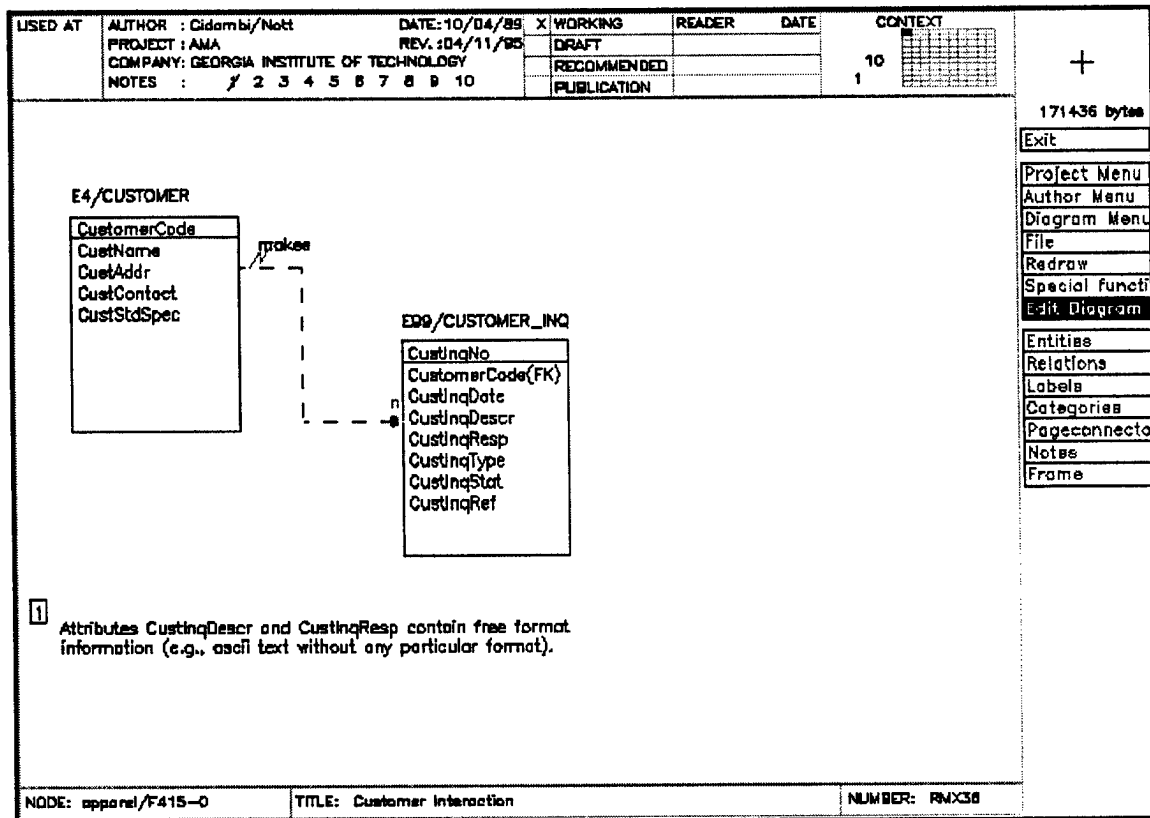

Figure 6-6. Original View: Customer Interaction

In Figure 6-7 the relationship of the Customer to the Sales Plan is shown, which is extremely important in a customer-focused enterprise. An entity, Sales Plan Administration, has been added that will handle the administrative information for a Sales Plan.
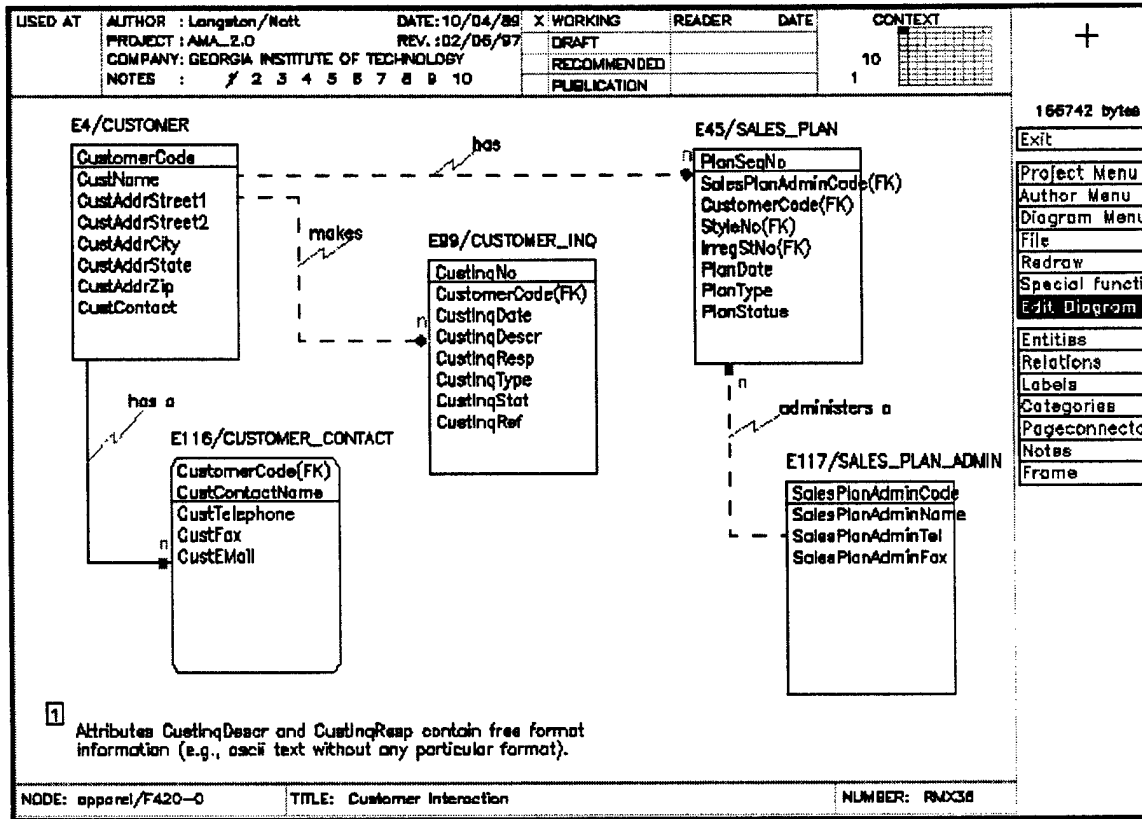

Figure 6-7. Enhanced View: Customer Interaction

6.4 Enhancement of F605-0 View

The original F605-0 Shipping Order Description is shown in Figure 6-8. The existing relationship between Shipping Notice and Shipping Order Item did not facilitate a mass customization paradigm.
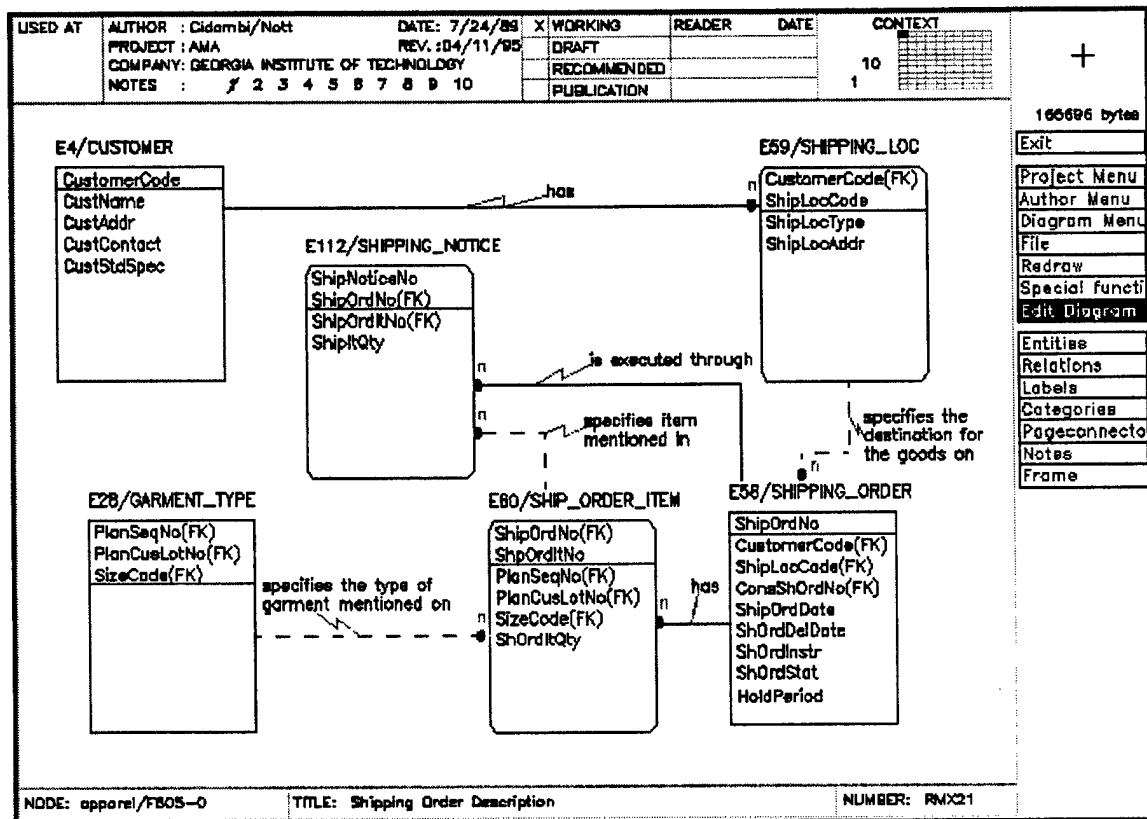

Figure 6-8. Original View: Shipping Order Description

The following changes were made to the Shipping Order Description view: The Billing Location entity was added to capture the billing information associated with a Customer. The Shipping Notice Item entity was added to contain individual line item information on a Shipping Notice that can be related to any Shipping Order Item. Therefore, the previous relationship between Shipping Notice and Shipping Order Item has been replaced by the relationship between Shipping Notice Item and Shipping Order Item. These changes are shown in Figure 6-9, Enhanced View: Shipping Order Description.
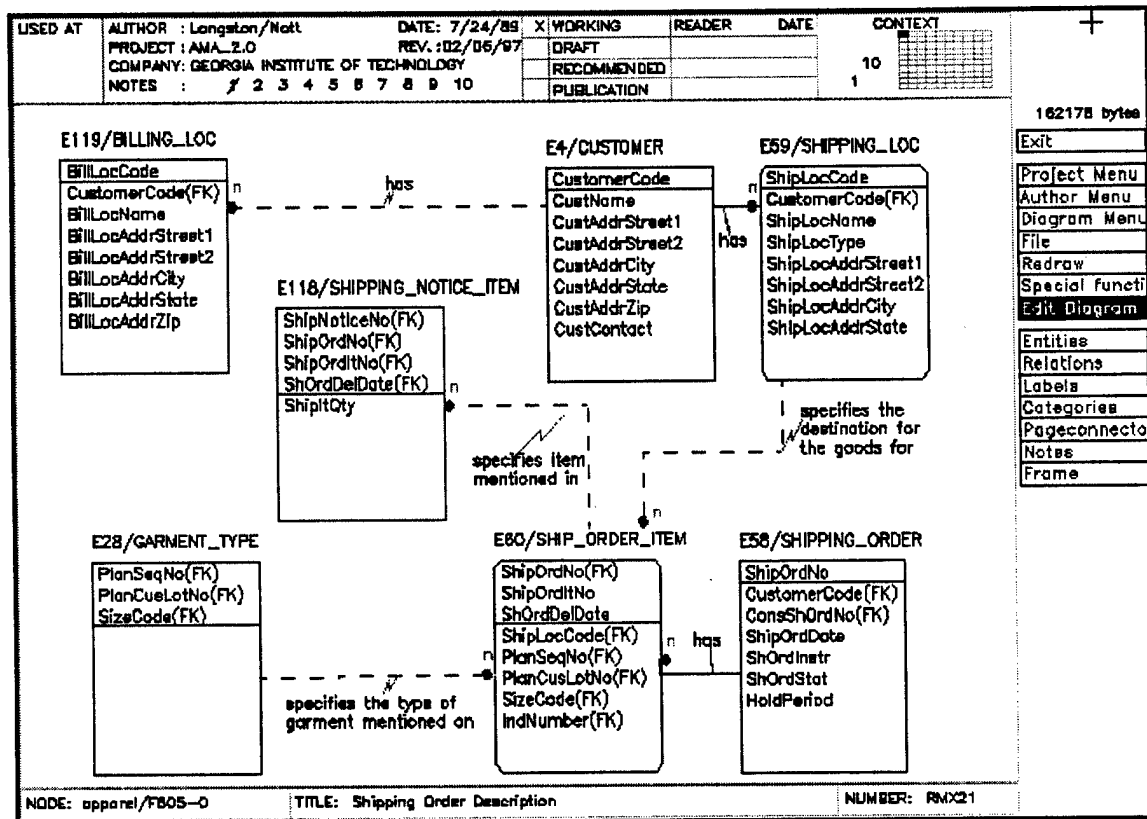

Figure 6-9. Enhanced View: Shipping Order Description

6.5   Creation of New View F615-0

View F615-0, Custom Order Placement, was added to AMA to show how an individual consumer's information is captured by the architecture (Figure 6-10). There are three new entities shown in the figure that contain custom order information: Individual, Measurement, and Measurement Items. These entities are bound to the Shipping Order Item by the entity named Individual. In the ordering of uniforms, Individual will refer to a recruit or active duty soldier. The new entities have been based on RICA, the Recruit Induction Center Architecture [5].
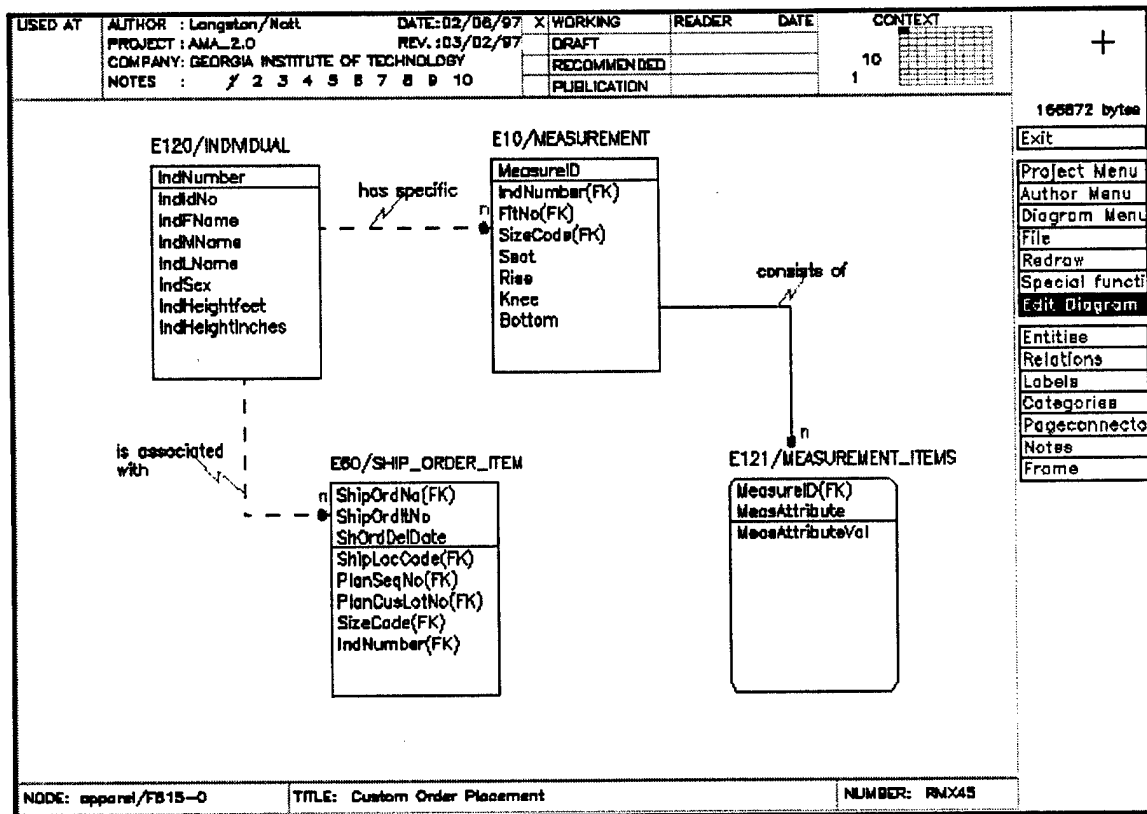

Figure 6-10. New View: Custom Order Placement

These enhancements were incorporated into AMA, thus enriching it and making it explicitly reflect the "quick response through customer order" paradigm.

7. EDI INTEGRATION

AOPM is a system being developed by EDI Integration Corporation (EIC), the other ARN Partner on PPFG-T5-P4, to facilitate EDI transactions between DPSC and DAMs. One of the objectives of PPFG-T5-P4 has been to integrate AOPM with ARN-AIMS so that the electronic order from DPSC will flow directly into the DAM and automate the entire Order Management process.

To facilitate this integration, Georgia Tech and EIC have been working closely to ensure that the data entities in AOPM will map into the AMA entities and eventually link seamlessly into the AMA-compliant ARN-AIMS. Tables 7-1 to 7-4 summarize the AMA/AOPM Mapping for EDI integration.

Table 7-1. ARN Industry Flat File Record Formats (Purchase Order)

REC CODE	FLD	MSG SET	Industry Name	Qual	ARN-AIMS
H	1	850	Header record code (H)		`Edi850.RecordCode`
H	2	850	Transaction set code (850)		`Edi850.TransSetCode`
H	3	850	Control number (serial number)		`Edi850.ControlNo`
H	4	850	Trading partner (sent to)		`Edi850.TradPartSentTo`
H	5	850	Trading partner (received from)		`Edi850.TradPartSentFrom`
H	6	850	PO Purpose Code (00=Original)		`Edi850.PurposeCode`
H	7	850	PO Type Code (BK=Blanket Order)		`Edi850.POTypeCode`
H	8	850	Contract Number + Call		`Sales Plan.PlanSeqNo`
H	9	850	Date of Delivery Order		`Shipping Order.DateRecd`
H	10	850	Accounting Data		`Edi850.AccountingData`
H	11	850	Ordering Site		`Customer.CustomerCode`
H	12	850	Ordering Contact	OC	`Customer.CusContact`
H	13	850	Ordering Contact Telephone	TE	`Customer.CusTelephone`
H	14	850	Submitted By (Originator)	SM	`Customer.CustomerName`
H	15	850	Submitted By Telephone	TE	`Edi850.SubmitByTel`
M	1	850	Measurement record code (M)		`Measurement.MeasuredId`
M	2	850		F	–
M	3	850		08	–
M	4	850	Measurement Details Format: Meascode (2 char) (space fill if the code is one character)+Space+Measure (6 digits) (space fill on left if less than 6 digits; format 999.99)+Space+Measurement description (from d_mdescr.measinst)		`Measurement.MeasuredId +Space+Edi850.Measure+ Space+Measurement.Comment s`
N	1	850	Names/Addresses record code (N)		`Edi850.NameAddRecCode`
N	2	850	Ship To Site Name	ST	`ShipLocation.ShipLocName`
N	3	850	Ship To Site DODAAC	10	`ShipLocation.ShipLocCode`
N	4	850	Name of Individual to Receive the Apparel		`ShipLocation.MarkedFor`
N	5	850	Measurement Taker Name		`Edi850.MeasTakerName`
N	6	850	Ship To Site Address -line 1		`ShipLocation.ShipLocAddrS treet1`
N	7	850	Ship To Site Address - line 2		`ShipLocation.ShipLocAddrS treet2`
N	8	850	Ship To Site City		`ShipLocation.ShipLocAddrC ity`
N	9	850	Ship To Site State		`ShipLocation.ShipLocAddrS tate`
N	10	850	Ship To Site Postal Code		`ShipLocation.ShipLocAddrZ ip`
N	11	850	Ship To Site Country		`ShipLocation.ShipLocAddrC ountry`
N	12	850	Sex/Profile identification	JD	`Measurement.Sex+Space+`

REC CODE	FLD	MSG SET	Industry Name	Qual	ARN-AIMS
			Format: Sex (1 char)+Space+Shoulders (3 char)+Bust (3 char) (space fill for male)+Space+Posture (3 char)+Space+Seat (3 char) (space fill)+Space+Abdomen (3char)+(space fill for male)+Build (3 char)		Measurement.Shoulders+ Space+Measurement.Bust+ Space+Measurement.Posture +Space+Measurement.Seat+S pace+Measurement.Abdomen+ Measurement.Build
L	1	850	Line item record code (L)		Edi850.LineItemRecCode
L	2	850	CLIN		ShipOrdItem.ShipOrdItNo
L	3	850	Quantity Ordered		PlanItem.PlanItemQty
L	4	850	Unit of Measurement Code [for quantity]		Measurement.MeasUnitCode
L	5	850	Unit Price		ShipNotice.UnitPrice
L	6	850	Delivery Date	ZZ	ShipNotice.DeliveryDate
L	7	850	Destination/Requisition	ZZ	PlanItem.PlanCusLotNo
L	8	850		F	-
L	9	850		08	-
L	10	850	National Stock Number///Garment Code - Note: For special measurement orders, add to the NSN//Garment Code the string "-SPECIAL ME" instead of a Size value.		PlanItem.NSN
L	11	850	Nomenclature (Article description)		ShippingOrderItem.Descrip tion
L	12	850	Line item note	LIN	ShippingOrderItem.Comment s
S	1	850	Summary record code (S)		Edi850.SummaryRecCode
S	2	850	Quantity/Dollar Totals		Edi850.DollarTotal
S	3	850	Number of Line Items		Edi850.NoLineItem
S	4	850	Purchase Order Amount		Edi850.POAmount
S	5	850	Tracing note		Edi850.TracingNote
S	6	850	Operator ID at time of release	PUR	Edi850.OperatorId
S	7	850	Age (2 digits) =Rank (2 char) +Component (AD, NG, AR,NR, FR, MR or blank)	EMC	Edi850.AgeRankComp

Table 7-2. ARN Industry Flat File Record Formats (Invoice)

REC CODE	FLD	MSG SET	Industry Name	Qual	ARN-AIMS
H	1	810	Header record code (H)		Edi810.RecordCode
H	2	810	Transaction set code (810)		Edi810.TransSetCode
H	3	810	Control number (serial number)		Edi810.ControlNo
H	4	810	Trading partner (sent to or received from)		Edi850.TradPartSentTo
H	5	810	Invoice Date		ShippingNotice.ShipDate
H	6	810	Invoice Number		ShippingNotice.ShipNoticeNo
H	7	810	Purchase Order Number - PIIN and CALL		ShipOrdNo.ShipOrdNo
H	8	810	Transaction Type Coce ("DI")		Edi850.TransTypeCode
H	9	810	Ship To Site Name	ST	ShipLocation.ShipLocName
H	10	810	Ship To Site DODAAC	10	ShipLocation.ShipLocCode
H	11	810	Terms Discount Percent		SalesPlan.DiscountTerms
H	12	810	Terms Discount Days Due (Number of days)		SalesPlan.DiscountTerms
H	13	810	Date Shipped	011	ShippingNotice.ShipDate
H	14	810	Ship ID	SI	ShippingNotice.ShipNoticeNo
L	1	810	Line item record code (L)		Edi850.LineItemRecCode
L	2	810	CLIN		ShippingOrderItem.ShipOrdItNo
L	3	810	Quantity Invoiced		ShippingOrderItem.ShipOrdActualQty
L	4	810	Unit of Measurement Code [for quantity]		Measurement.MeasUnitCode
L	5	810	Unit Price		ShippingNoticeItem.UnitPrice
L	6	810	Product/Service ID	FS	PlanItem.NSN
L	7	810		F	–
L	8	810		08	–
L	9	810	Item Description		ShippingOrderItem.Description
S	1	810	Summary record code (S)		Edi850.SummaryRecCode
S	2	810	Total Invoice Amount		ShippingNotice.ShipNoticeTotal
S	3	810	Amount Subject to Time Discount		SalesPlan.DiscountAmount
S	4	810	Transportation Method Code		ShippingNotice.TransCode
S	5	810	Shipment Idntifying Number		ShippingNotice.ShipNoticeNo
S	6	810	Allowance or Charge Indicator		ShippingNotice.ShipNoticeTotal
S	7	810	Allowance or Charge Amount (For Premium Trransportation Authorized)		ShippingNotice.FreightCharge
S	8	810	Number of Line Items		Edi810.NoLineItem

Table 7-3. ARN Industry Flat File Record Formats (Ship Notice)

REC CODE	FLD	MSG SET	Industry Name	Qual	ARN-AIMS
H	1	856	Header record code (H)		Edi856.RecordCode
H	2	856	Transaction set code (856)		Edi856.TransSetCode
H	3	856	Control number (serial number)		Edi856.ControlNo
H	4	856	Trading partner (sent to or received from) STCODE		Edi850.TradPartSentTo
H	5	856	Purchase Order Number - PIIN and CALL	00	ShippingOrder.ShipOrdNo
H	6	856	Transaction Date		ShippingNoticeItem.ActualDeliveryDate
H	7	856	Transaction Time		Edl856.TransTime
H	8	856	Contract Number	CT	SalesPlan.PlanSeqNo
H	9	856	Shipment ID	CT	ShippingNotice.ShipNoticeNo
N	1	856	Name record code (N)		Edi856.NameRecCode
N	2	856	Operator ID at time of release	PC	Edi856.OperatorIdRel
N	3	856	Prime Contractor Name	PG	ShippingOrder.PCCName
N	4	856	Address		ShippingOrder.PCCAddr1 &2
N	5	856	City		ShippingOrder.PCCCity
N	6	856	State		ShippingOrder.PCCState
N	7	856	Postal Code		ShippingOrder.PCCZip
N	8	856	Country		ShippingOrder.PCCCountry
N	9	856	Admin Name	NG	Customer.CustName
N	10	856	Address		Customer.CustAddrStr1&2
N	11	856	City		Customer.CusCity
N	12	856	State		Customer.CusState
N	13	856	Postal		Customer.CusZip
N	14	856	Country		Customer.CusCountry
N	15	856	Administrative Contact Name	AM	Customer.CusContact
N	16	856	Telephone	TE	Customer.CusTelephone
N	17	856	Fax	FX	Customer.CusFax
N	18	856	Ship From Name	SF	ApparelMfg.Name
N	19	856	Address		ApparelMfg.Address
N	20	856	City		ApparelMfg.City
N	21	856	State		ApparelMfg.State
N	22	856	Postal		ApparelMfg.POBox
N	23	856	Country		ApparelMfg.Country
N	24	856	Pay BY Contact Name	PT	SalesPlan.PayContactName
N	25	856	Address		SalesPlan.PayContactAddr
N	26	856	City		SalesPlan.PayContactCity
N	27	856	State		Salesplan.PayContactState
N	28	856	Postal code		SalesPlan.PayContactZip
N	29	856	Country		SalesPlan.PayContactCountry
N	30	856	Ship To Site Name	ST	ShipLocation.ShipLocName
N	31	856	DODAAC	10	ShipLocation.ShipLocCode
N	32	856	Clothing For		ShipLocation.MarkedFor
N	33	856	Address		ShipLocation.ShipLocAddrStr1 &2
N	34	856	City		ShipLocation.ShipLocCity
N	36	856	State		ShipLocation.ShipLocState
N	37	856	Postal code		ShipLocation.ShipLocZip

REC CODE	FLD	MSG SET	Industry Name	Qual	ARN-AIMS
N	38	856	Country		ShipLocation.ShipLocCountry
N	39	856	Transaction Note	GEN	Edi856.TransNote
L	1	856	Line item record code (L)		Edi856.LineItemNote
L	2	856	Hierarchial ID Number	V	Edi856.HierIDNo
L	3	856	National stock Number	FS	PlanItem.NSN
L	4	856	Garment Code	F7	GarmentUnit.GarUnitNo
L	5	856	CLIN	BV	ShipNoticeItem.ShipOrdItNo
L	6	856	Quantity Shipped	39	ShipNoticeItem.ShipItQty
L	7	856	Unit of Measurement Code [for quantity]		Measurement.MeasUnitCode
L	8	856	Shipping Note	DEL	ShipNotice.ShipNoticeNo

Table 7-4. ARN Industry Flat File Record Formats (Receiving Report)

REC CODE	FLD	MSG SET	Industry Name	Qual	ARN-AIMS
H	1	824	Header record code (H)		`Edi824.RecordCode`
H	2	824	Transaction set code (824)		`Edi824.TransSetCode`
H	3	824	Control number (serial number)		`Edi824.ControlNo`
H	4	824	Trading partner (sent to or received from)		`Edi850.TradPartSentTo`
H	5	824	Purchase Order Number - PIIN and CALL	00	`ShippingOrder.ShipOrdNo`
H	6	824	Transaction Date		`ShippingNoticeItem.ActualDeliveryDate`
H	7	824	Contract Number		`SalesPlan.PlanSeqNo`
N	1	824	Header record code (N)		`Edi824.HeadRecCode`
N	2	824	Operator ID at time of release	FJ	`Edi856.OperatorIdRel`
N	3	824	Prime Contractor Site Name	PG	`ShippingOrder.PCCName`
N	4	824	Prime Contractor Site Address, line 1		`ShippingOrder.PCCAddr1&2`
N	5	824	Prime Contractor Site City		`ShippingOrder.PCCCity`
N	6	824	Prime Contractor Site State		`ShippingOrder.PCCState`
N	7	824	Prime Contractor Site Postal Code		`ShippingOrder.PCCZip`
N	8	824	Prime Contractor Country		`ShippingOrder.PCCCountry`
N	9	824	Administered By Site Name	NG	`Customer.CustName`
N	10	824	Administered By Site Address, line 1		`Customer.CustddrStreet1&2`
N	11	824	Administered By Site City		`Customer.CustAddrCity`
N	12	824	Administered By Site State		`Customer.CustAddrCity`
N	13	824	Administered By Site Postal Code		`Customer.CustAddrZip`
N	14	824	Administered By Site Country		`Customer.CustAddrCountry`
N	15	824	Administrative Contact	AM	`Customer.CusContact`
N	16	824	Administrative Contact Telephone	TE	`Customer.CusContactTel`
N	17	824	Administrative Contact Fax	FX	`Customer.CusContactFax`
N	18	824	Ship From Site Name	SF	`ApparelEnterprise.Name`
N	19	824	Ship From Site Address line 1		`ApparelEnterprise.Address`
N	20	824	Ship From Site City		`ApparelEnterprise.City`
N	21	824	Ship From Site State		`ApparelEnterprise.State`
N	22	824	Ship From Site Postal Code		`ApparelEnterprise.POBox`
N	23	824	Ship From Site Country		`ApparelEnterprise.Country`
N	24	824	Pay By Site Name	PR	`SalesPlan.PayContactName`
N	25	824	Pay By Site Address, line 1		`SalesPlan.PayContactAddr`
N	26	824	Pay By Site City		`SalesPlan.PayContactCity`
N	27	824	Pay By Site State		`Salesplan.PayContactState`
N	28	824	Pay By Site Postal Code		`SalesPlan.PayContactZip`

REC CODE	FLD	MSG SET	Industry Name	Qual	ARN-AIMS
N	29	824	Pay By Country		SalesPlan.PayContactCountry
N	30	824	Shipped To Site Name	ST	ShipLocation.ShipLocName
N	31	824	Ship To Site DODAAC	10	ShipLocation.ShipLocCode
N	32	824	Clothing For Name		ShipLocation.MarkedFor
N	33	824	Shipped To Site Address, line 1		ShipLocation.ShipLocAddr
N	34	824	Shipped To Site City		ShipLocation.ShipLocCity
N	35	824	Shipped To Site State		ShipLocation.ShipLocState
N	36	824	Shipped To Site Postal Code		ShipLocation.ShipLocZip
N	37	824	Shipped To Country		ShipLocation.ShipLocCountry
L	1	824	Line item record code (L)		Edi824.LineItemrecCode
L	2	824	Application [item] acknowledgment code		Edi824.AckCode
L	3	824	CLIN	BV	ShippingOrderItem.ShipOrdItNo
L	4	824	Unit Price	LI	ShippingNoticeItem.UnitPrice
L	5	824	Quantity Shipped	39	ShippingNoticeItem.ShipItQty
L	6	824	Unit of Measurement Code [for quantity]		Measurement.MeasUnitCode
L	7	824	Quantity Approved	QA	Edi824.QuantityApproved
L	8	824	Unit of Measurement Code [for quantity]		Measurement.MeasUnitCode
L	9	824	Receiving Note	QTY	Edi824.ReceivingNote

8. CONCLUSIONS

This research has led to the development of an information system – ARN-AIMS – for the defense apparel enterprise. It is based on the building blocks in the apparel manufacturing architecture (AMA) developed as part of previous research sponsored by the Defense Logistics Agency. The benefits of this architectural approach to systems development have been conclusively demonstrated based on the case studies in this project.

ARN-AIMS consists of three modules – Order Processing, Order Tracking and Shipping & Invoicing. The Order Processing Module is designed to facilitate the entry of customer orders for stock and special measurements for both military and commercial products. The Order Tracking Module helps the defense apparel manufacturer (DAM) track the status of an order in any part of the enterprise – from order entry through invoicing -- and identify bottlenecks in the system. It helps the DAM respond easily to inquiries from the customer (e.g., DPSC). The Shipping & Invoicing Module generates an invoice (e.g., DD250) based on the order information entered in the system. ARN-AIMS runs on IBM-compatible machines in Microsoft Access for Windows 95.

ARN-AIMS has been successfully implemented at three DAM sites: The New Maryland Clothing Company in Baltimore, Maryland, DeRossi & Son in Vineland, New Jersey, and Gibraltar Clothing in San Lorenzo, Puerto Rico. Prior to the implementation of ARN-AIMS, the Delivery Orders from DPSC were entered and processed either manually or using a spreadsheet. Order Tracking in the enterprise was done manually and there was no formal system in place. The generation of invoices (DD250) was yet another time-consuming and labor-intensive process often requiring the reentry of Contract/Delivery Order information that was originally entered during the Order entry process, leading to errors. The Order Entry/Processing, Order Tracking and Shipping/Invoicing operations were heavily dependent on the one or two individuals associated with those operations.

Since the implementation of ARN-AIMS, the Order Entry/Processing time has been reduced from approximately 115 minutes to 30 minutes for a single Delivery Order -- a 74% reduction. The time associated with tracking an Order and responding to a *single* query from DPSC on a Delivery Order has been reduced from approximately 200 minutes to 5 minutes -- a 97% reduction. The time for invoicing (preparation and generation of DD250 forms) has been reduced from 140 minutes to 15 minutes -- an 89% reduction. The metrics represent a composite view of the timesaving at the three locations. Note: the Order Tracking module has not been implemented at DeRossi & Son. In addition to these tangible savings, ARN-AIMS has reduced the need for duplicate data entry (and associated errors), reduced the amount of manual paper exchange and helped the enterprise organize and enforce a consistent cut scheduling process.

There are significant savings with respect to time, cost, and type of expertise required for the development of an information system when the AMA building blocks are used as the underlying infrastructure for the system. Since AMA provides the data tables for order

entry, tracking and shipping, no time and costs are incurred for these, and there is no need for special expertise in data modeling and process analysis when the architectural approach is adopted for system development. Moreover, the time and cost expenditures may be too high for most apparel companies who will be hard pressed to have in-house expertise in data process analysis and data modeling. Thus, by adopting the architectural approach with the AMA building blocks as the starting point, an apparel company can save nearly a person-year of effort and approximately $100,000 for developing a system such as ARN-AIMS.

There are significant savings in the costs associated with adding *new* functionality to the existing systems when they are built upon AMA-compliant systems. ARN-AIMS has been easily transported from one enterprise and implemented in another with minor customization because it is based on AMA -- architecture developed after an extensive and thorough analysis of apparel industry business practices.

In short, ARN-AIMS is enabling the DAM to obtain information *on demand* and use it very effectively for running the enterprise. ARN-AIMS paves the way for realizing an information-integrated supply chain (IISC) in the production and distribution of military clothing items -- one of the primary goals of the DLA-ARN Program.

References

[1]   Jayaraman, S., "Design and Development of an Architecture for
        Computer-Integrated Manufacturing in the Apparel Industry, Part I: Basic
        Concepts and Methodology Selection", Textile Research Journal, vol. 60, No. 5,
        pp. 248-254, May 1990.

[2]   Malhotra, R., and Jayaraman, S., "Design and Development of an Architecture for
        Computer-Integrated Manufacturing in the Apparel Industry, Part II: The Function
        Model", Textile Research Journal, vol. 60, no. 6, pp. 351-359, June 1990.

[3]   Jayaraman, S., and Cidambi, A., Apparel Manufacturing Architecture [Version
        1.5], Volume I: AMA Primer, Volume II: The Function Model, Volume III: The
        Information Model, Technical Report SJ-TR-ARCH-9412, Georgia Institute of
        Technology, Atlanta, Georgia, December 1994.

[4]   The Apparel Manufacturing Architecture HomePage:
        http://nanda.tfe.gatech.edu/ama/ama.html, Georgia Institute of Technology,
        Atlanta, Georgia, August 1996.

[5]   Jayaraman, S., et. al, Recruit Induction Center Architecture (RICA): Function and
        Information Models for the Uniform Distribution Process at Recruit Induction
        Centers, Technical Report SJ-TR-ARCH-9501, Georgia Institute of Technology,
        Atlanta, Georgia, January 1995.
                                        * * *

Appendix

ARN-AIMS User Manual

ARN-AIMS
ARN-Apparel Information Management System

What is ARN-AIMS?

ARN-AIMS is an apparel information management system developed at the Georgia Institute of Technology, Atlanta, Georgia, under funding from the US Defense Logistics Agency. Currently, it consists of three modules – Order Processing, Order Tracking and Shipping & Invoicing. The Order Processing Module is designed to facilitate the entry of customer orders for stock and special measurements for both military and commercial products. The Order Tracking Module helps the manufacturer track the status of an order in any part of the enterprise – from order entry through invoicing. It helps the manufacturer respond easily to inquiries from the customer (e.g., DPSC). The Shipping & Invoicing Module generates an invoice (e.g., DD250) based on the order information entered in the system.

What ARN-AIMS can do for a Defense Apparel Manufacturer?

ARN-AIMS can

- Effectively track the product from beginning to end of the supply chain
- Identify bottlenecks by flagging a problem source
- Provide an information system catering to regular production and special measurement scenarios
- Provide the ability to query information about past and present orders
- Provide a mechanism to input orders and generate invoices within the same system

Other features of ARN-AIMS include the following:

- Add, modify or delete information as required
- Organize information from various sources and store it in a single database
- Allow access to information based on the user's level of authority and responsibility
- Provides a mechanism to analyze the data according to user specification
- Provides a mechanism to generate and print reports

DAM

Before ARN-AIMS (box):
- Information: Hard to Obtain
- Centralized Planning & Decision Making
- Difficult to track status of products
- Cuts issued at random
- No easy means to integrate with EDI
- Invoicing discrepancies occur
- Individual dependent for managing information

After ARN-AIMS (box):
- Information on Demand
- Decentralized Planning & Decision-Making
- Easy to track status of products
- Logical order in issuing cuts
- Easy to integrate with EDI Orders
- No invoicing discrepancies
- Deskilling of managing information

AMA

Information System

Before ARN-AIMS

After ARN-AIMS

System Requirements for ARN-AIMS

Hardware: IBM Compatible 100MHz (or higher) PC
Hard disk: 1 GB
Memory: 32MB or higher
Operating System: Windows 95
Software: Microsoft Access for Windows 95, Easy Form -DD250 software
Training: 2-3 days
Time to implement at DAMs: 1-2 weeks
User skills: Knowledge of Windows 3.1 or Windows 95 and spreadsheet/database software

For More Information on ARN-AIMS, Please Contact

Dr. Sundaresan Jayaraman
Professor
Georgia Institute of Technology
School of Textile & Fiber Engineering
Atlanta, Georgia 30332-0295
Phone: 404-894-2490
Fax: 404-894-8780
Email: sundaresan.jayaraman@tfe.gatech.edu

Overview

The ARN-AIMS User Manual provides a step-by-step set of instructions for making effective use of ARN-AIMS in a defense apparel manufacturing enterprise. It covers the following major facets of the current scope of ARN-AIMS, i.e., Order Processing, Order Tracking and Shipping/Invoicing:

1.   Add a New Contract

2.   Add a New Delivery Order

3.   Assign Items to Cutting

4.   Assign Cut Items to Manufacturing

5.   Assign Manufactured Items to Invoicing

6.   Generate DD250 Forms (Invoices)

The major steps for carrying out each of these tasks are outlined with specific example screens to enhance the understanding of ARN-AIMS and its use.

1. Add a New Contract

1. Click on the **Order Processing** icon in the *Main Menu* (Figure 1).
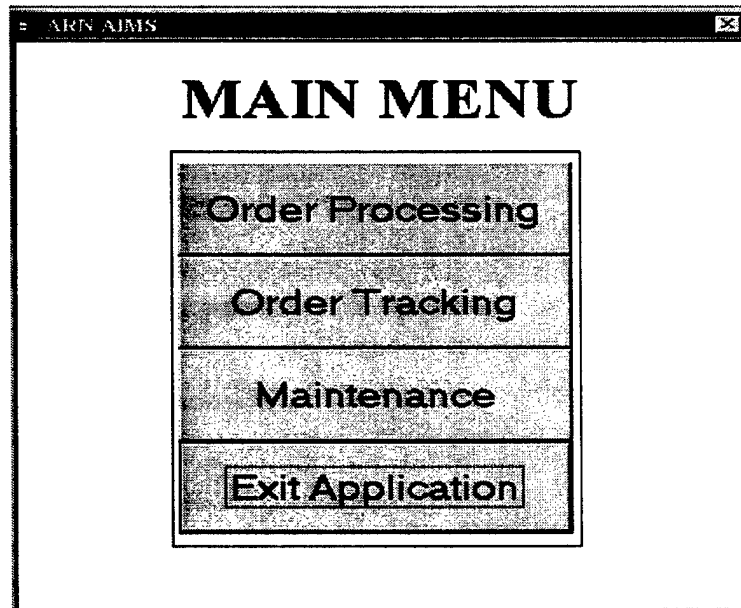
Figure 1. Main Menu

You will now be presented with *Process Orders Menu* (Figure 2).
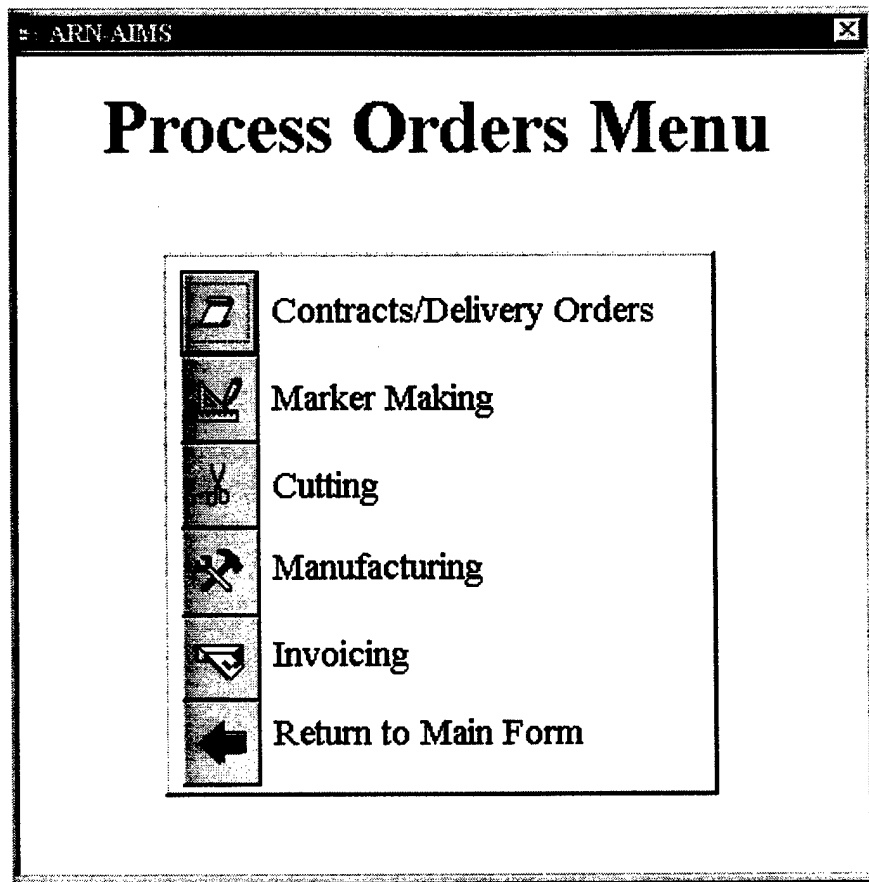
Figure 2. Process Order Menu

2. Click on **Contracts/Delivery Orders** icon
   You will be presented with *Contract and Deliver Order Menu* (Figure 3).
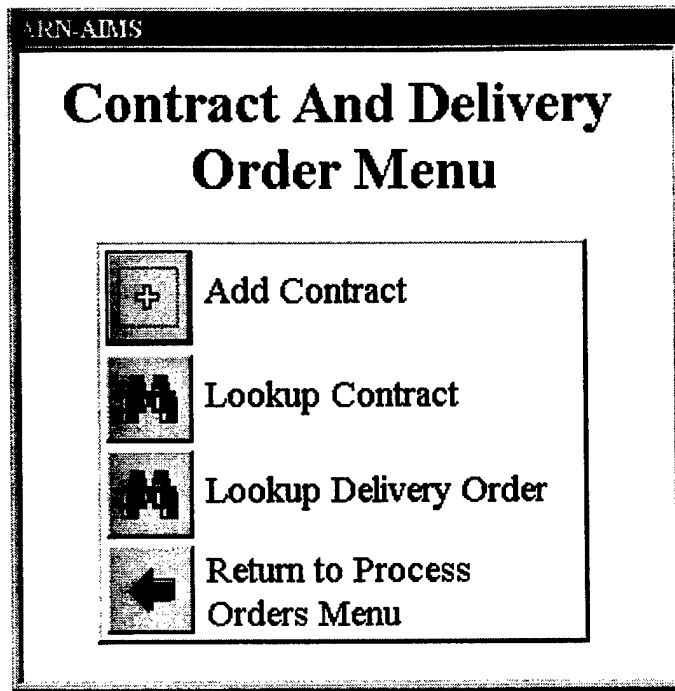
Figure 3. Contract and Delivery Order Menu

3. Click on the **Add Contract** icon.
   You will be presented with a form to enter all information about a contract (Figure 4).

Figure 4. New Contract Addition Form

The instructions for filling out this form are shown in Table 1.

Table 1 Instructions for Adding a New Contract

Field Name	What You Enter in this Field
Contract	Enter the Contract Number.
Option	Enter the Option for the Contract. If you do not know the option, enter 1.
Contract Start Date	Enter the contract start date in the following format: mm/dd/yy
Allowed Deliver Time	Enter the delivery time in days.
Service	Check one of the boxes to specify if the contract is from the Army, Navy or Air Force.
Coat Price	Enter the price of the garment in dollars and cents in the following format: dd.cc
Shipping Cost	Enter the cost of shipping per garment in dollars and cents in the following format: dd.cc
GFM	Enter the cost of Government Furnished Materials (GFM) in dollars and cents in the following format: dd.cc
CMT	Enter the CMT in dollars and cents in the following format: dd.cc
Discount Terms	Enter the discount terms as it would be printed in the DD250 Form.

4. Click on the **Return to Contract Menu** icon.

You have completed entering details about a new contract.

2. Add a New Delivery Order

1. Click on the **Order Processing** icon in the *Main* Menu (Figure 1).
   You will now be presented with *Process Orders* Menu (Figure 2).

2. Click on **Contracts/Delivery Orders** icon.
   You will be presented with *Contracts and Deliver Order* Menu (Figure 3).

3. Click on the **Lookup Contract** icon.
   Enter * in the **Find What Field**.
   Click on the **Find Next** icon till you find the contract associated with the delivery order.
   Once you have found the contract, click on the **Close Form** icon.

4. Click on the **Add Delivery Order** icon to go the following Order Entry form (Figure 5).

Figure 5. Order Entry Form

Instructions for Filling the Header Information for a Delivery Order:

5. Select the Type of the Delivery Order:
   SM - Special Measurement
   SO - Stock Order
   DVD - Direct Vendor Delivery

6. Enter the Delivery Order Number.

63

7. Enter the Date Received.

8. Enter the Delivery Date.

9. Enter the Administered By Code and press Enter.
>If it is a new code, you will be asked:
>>Enter a New Customer?
>Select Yes.
>Enter the Name and Address.
>Click on the **Close Form** icon.

Instructions for Filling out CLIN Information for a Deliver Order:

10. Click on the **Enter Line Item** icon.
11. Fill in the following:

>*CLIN*
>*Quantity*

>*Ship To* Code *(DODAAC Code)* and press Enter. If it is a new code, you will be asked:
>>Enter a New Customer?
>>>Select Yes.
>>>Enter the Name and Address.
>>>Click on the **Close Form** icon.

>*Style*
>*NSN Number*

>Click on the **Close Form** icon.

12. Go to Step 10 to fill in additional CLINs on the Delivery Order.

13. If you make a mistake while entering the CLIN numbers, do the following:
>Select the Line Item by clicking on the Triangle Icon to the left of the status field.
>Click on the **Edit Line Item** icon to correct the mistake.
>After you have made the corrections, click on the **Close Form** icon.

3. Assign Items to Cutting

1. Click on the **Order Processing** icon in the *Main* Menu.
   You will now be presented with *Process Orders* Menu.

2. Click on **Cutting** icon.
   You will be presented with *Cutting Form* (Figure 6).

Figure 6. Cutting Form

3. Click on the **Close** icon.

4. Click on the **Add New Cut** icon.

<u>Instructions for filling the Cut Order Header:</u>

5. Enter the Cut Number (Assign a unique number if you do not know the cut number).

6. Enter the Cut Date.

7. Enter the Cut Ready Date (it can be the same as Cut Date).

8. Enter the Cut Priority – 1 or 2 or 3.

<u>Instructions for Adding Line Items in Delivery Orders to a Cut Order:</u>

9.   Look at the *Items to be Cut* Menu and Add the Total Quantity and Quantity to be filled.

10.   Select the CLIN you want to add to cutting by clicking on the small triangle to the left of the line item.

11.   Click on the **Add Cut Item** icon to add the CLIN to the Cut Order.

12.   Go to Step 10 to add additional CLINs to the Cut Order.

13.   Click on the **Close Form** icon to finish.

4. Assign Cut Items to Manufacturing

1. Click on the **Order Processing** icon in the *Main* Menu.
   You will now be presented with *Process Orders* Menu.

2. Click on **Manufacturing** icon.
   You will be presented with *Manufacturing Form* (Figure 7).

Figure 7. Manufacturing Form

3. Click on the Records button at the bottom to find out the Cut Order that you want to Add to Manufacturing.

4. Add the Actual Cut Ready Date.

5. Select the CLIN you want to add to cutting by clicking on the small triangle to the left of the line item.

6. Click on the **Add to Manufacturing** icon to add the CLIN to Manufacturing.

7. Go to Step 5 to add additional CLINs to Manufacturing.

8. Click on the **Close Form** icon to finish.

5. Assign Manufactured Items to Invoicing

1. Click on the **Order Processing** icon in the *Main* Menu.
    You will now be presented with *Process Orders* Menu.

2. Click on **Invoicing** icon.
    You will be presented with *Invoicing Form* (Figure 8).

Figure 8. Invoicing Form

3. Click on the Close Button.

4. Click on Add Invoice Icon.

5. Add the Shipping Date, B/L, Paid By Code, Lot Number and Freight Weight.

6. Select the CLIN you want to add to invoice by clicking on the small triangle to the left
    of the line item in the top form (make sure that they are all from the same delivery
    order).

7. Click on the **Add Invoice Item** icon to add the CLIN to the invoice

8. Go to Step 6 to add additional CLINs to Invoicing.

68

6. Generate DD250 Form

1. Click on the **Order Processing** icon in the *Main* Menu.
   You will now be presented with *Process Orders* Menu.

2. Click on **Invoicing** icon.
   You will be presented with *Invoicing* Menu.

3. Type * and Click on the Find Next Button till you find your Invoice.

4. Click on the **Generate DD250** icon.

5. Type in a filename with .rec extension.

6. Your DD250 will be automatically generated and stored in the
   Programf/Easysoft/EasyForm folder. You can print the DD250 forms directly from
   the EasyForm program.

<p align="center">* * *</p>